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The Chemical Age

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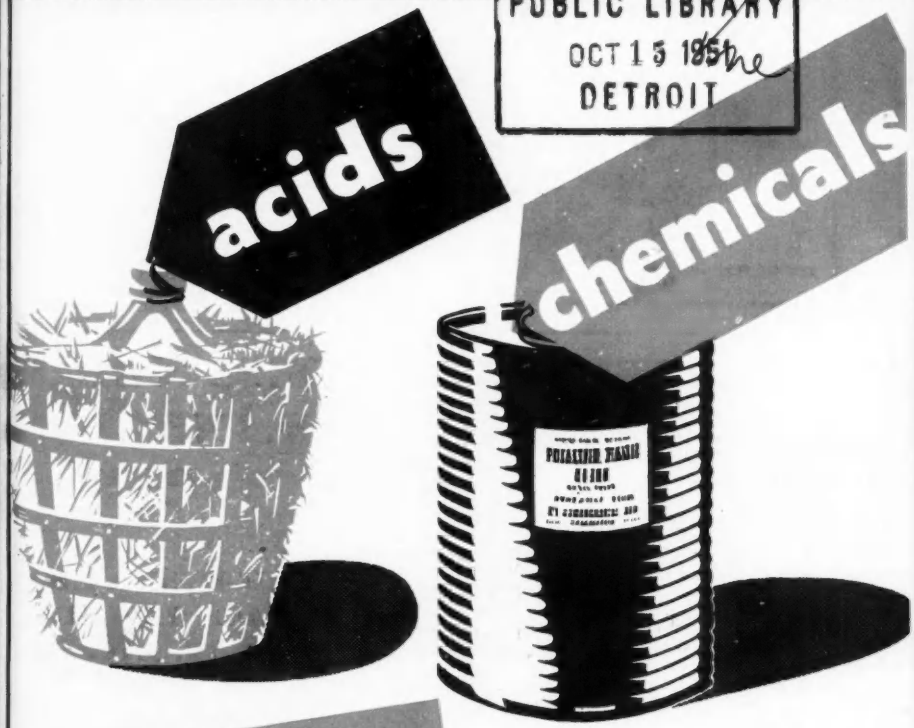

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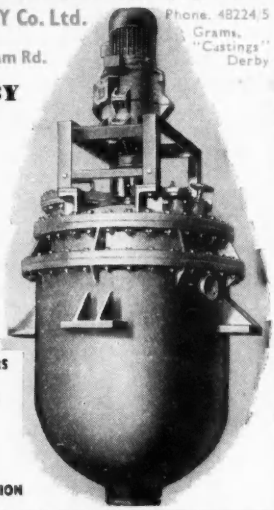

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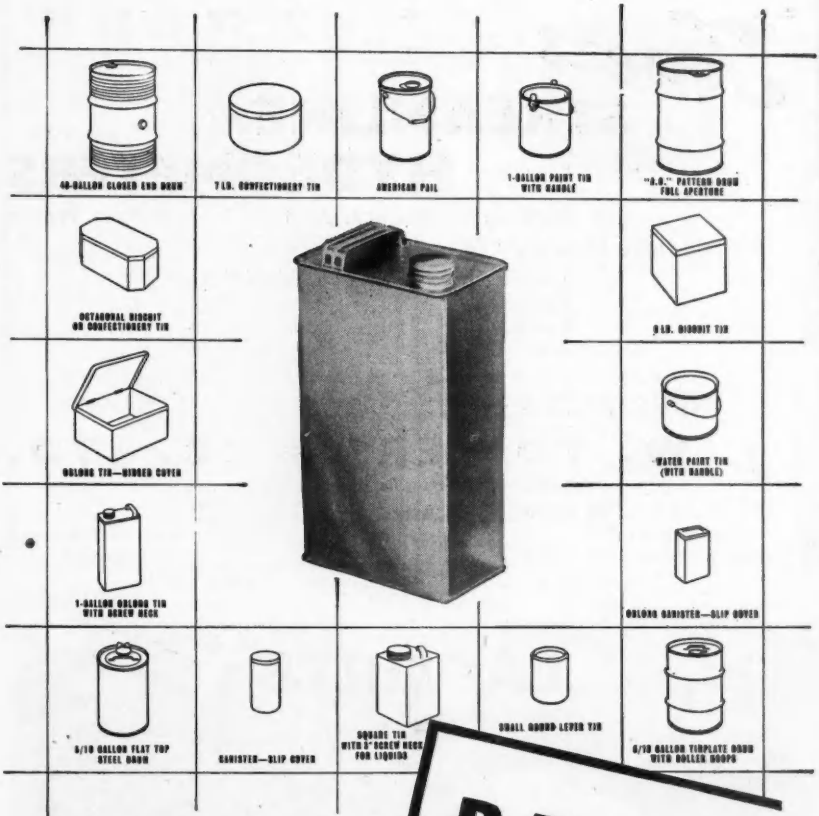
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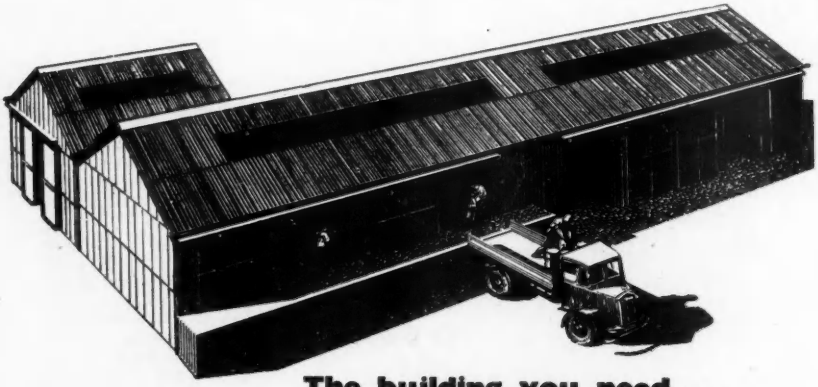

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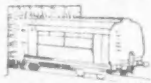
For the formulation of compounds for washing cars **and trains**  **and even buildings** **for the preparation of glass-cleaning detergents for dairies, hotels etc.** **for cleaning, treating or pickling metal in alkaline or acid solutions** **for wetting textile fibres** **washing fruit and vegetables** **for agricultural sprays** **and insecticides, for packing as a synthetic detergent as such** **or for compounding with great ease into detergent and scouring powders** **the ideal base for every type of detergent is ....**

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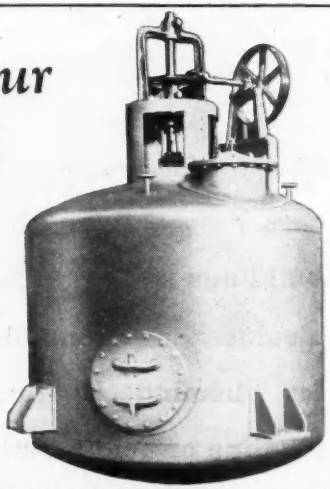

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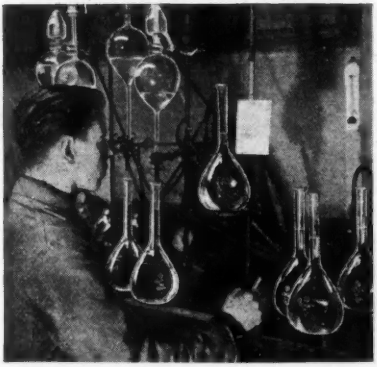

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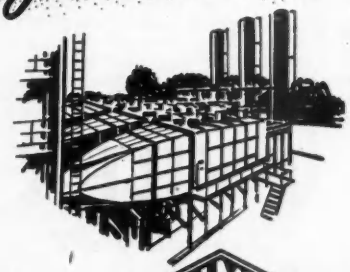

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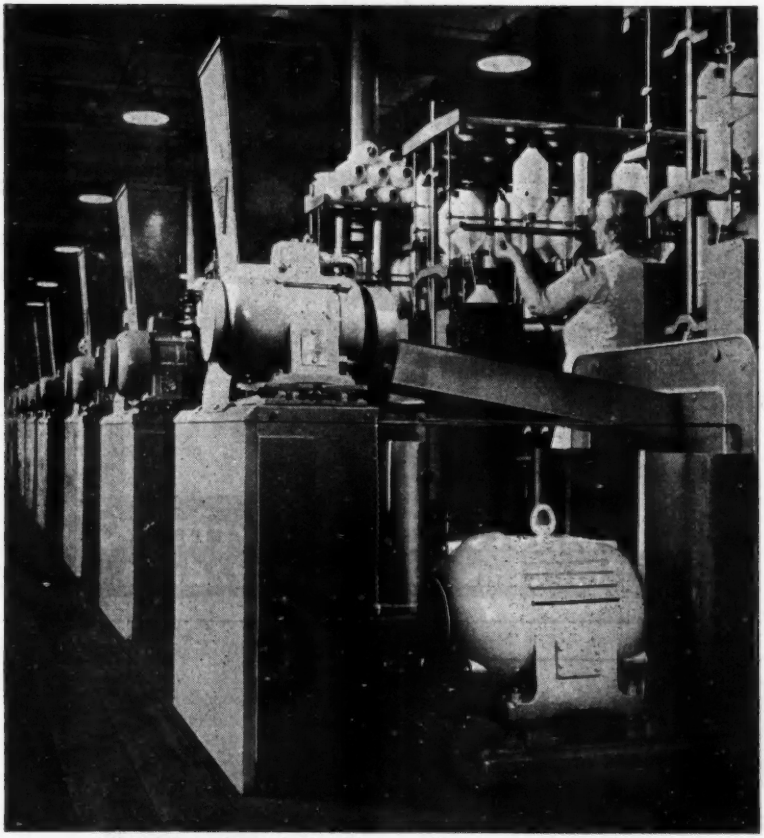

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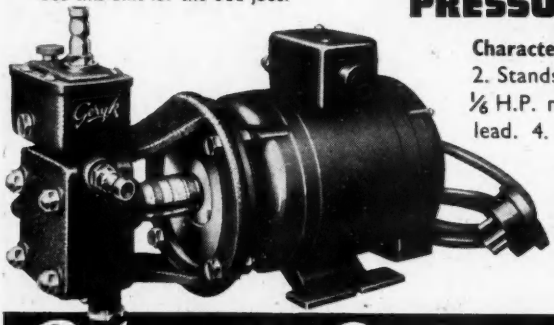

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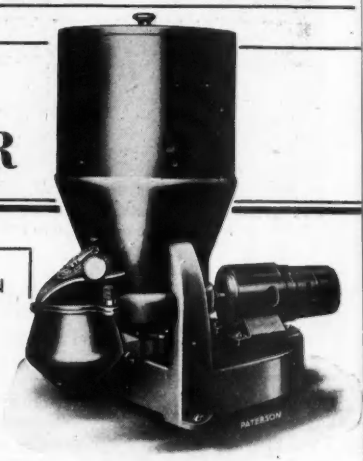

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Volume LXV 29 September 1951 Number 1681

Chemicals and Man-power

EVEN before the demands of re-armament complicated British economy there was a substantial shortage of chemists and skilled workers in the chemical industry. This shortage was frequently referred to in these pages during the earlier post-war years. Not only had the responsibilities of the industry expanded vastly during the Hitler war but the supply of new blood for the industry had been reduced. It clearly required a number of years of active reconstruction for the war-caused gap to be filled; indeed, for any hope of this to be realised within reasonable time, a substantial expansion of our facilities for chemical education was urgently needed.

Two or three years ago estimates of the industry's man-power needs reflected rather different national tasks than those that face the industry to-day. The industry then had two major responsibilities —to export products to dollar markets and to produce dollar-saving goods for the home market. It would be a foolhardy economist who suggested that these duties have appreciably diminished. World events have imposed additional responsibilities upon the industry since then. The many chemical needs of re-armament have been added. Severe raw material problems have arisen and their solution or amelioration inevitably depends upon chemists. If a few of the post-war plans for the chemical industry's expansion have been deferred because of the change in the world situation, the new tasks that arise from this same cause are not only bigger but more urgent.

Statistics and surveys are not necessary to prove that a real scarcity of chemists and skilled chemical workers exists at present. Highly reputable companies offer many vacancies in the advertising columns of chemists' professional journals. It is only too apparent that many of these vacancies remain unfilled for seriously long periods. The technical services of the Government are constantly announcing what can only be called 'batches' of vacancies. Some companies have recently drawn a more emphatic attention to their needs by using full-page or half-page announcements—the issue of *Chemistry and Industry* for 22 September will provide examples of this. Yet there are solid reasons for believing that the situation will grow worse.

Chemists begin with chemical education. Some particular combination of

genes may be required in the human formula for a man or woman to become a good chemist but the raw material must be carefully moulded. The time has long since gone when the determined character with a flair for chemistry could enter the industry and make relatively untrained contributions to it. The very reverse is all too true—the amount of training now required has become almost frighteningly formidable. The universities are teaching a much greater number of students than before the war but it is dangerously misleading to use figures from the nineteen-thirties as a base for comparison. Those were bad years of economic depression, of under-production, and scientific neglect; indeed, some part of the scientific man-power problem of the present must be laid on the doorstep of the 'thirties. The universities are coping with this increased number of students with much the same accommodation they possessed before the war. If some new buildings have been erected, those older buildings destroyed in the last war must also be reckoned in the total calculation. The new technological colleges, of which so much has been said and written, are still plans rather than realities. The teaching duties of university staffs have greatly increased, and this cannot be without effect upon that other duty of the university—the steady conducting of fundamental research.

Nor is the output of the universities freely available to industry or to research. Originally when this country adopted compulsory military service for young men in wartime, scientific students were exempted. With the lengthening of this service, exemption for technical students ceased. Now the future chemist must fulfil his period of service before or after qualifying. Apart from the immediate intensification of the chemist shortage that this causes, it brings the longer-term consequence that such men are reservists. In addition, many ex-service men have been trained as skilled chemical workers since the war and they, too, are reservists. Should real war come, to whom will they belong? The human being, unlike the yeast cell, cannot be split into two effective halves. Difficult as the present situation is, the future could be disastrously chaotic. It must be hoped that high-level consideration is being given to this latter type of problem, for it increases in seriousness the longer it is evaded. No one can predict the sizes or shapes of the future tasks of the chemical industry, but one fact is certain whether the world becomes more peaceful or more hostile —the tasks will be huge and will constantly require new supplies of man-power.

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Notes & Comments

Fertiliser Depresssion ?

ONE of the few branches of the chemical industry facing trade recession to-day is the fertiliser industry. As is well known, the prices of fertilisers rose fairly sharply on 1 July last, the fateful date of subsidy withdrawal. So far the reaction of farmers has been sharp. The drop in demand can more fairly be called a crash. After many years of expansion so abrupt a change is both disheartening and dangerous. The steadily increased application of fertilisers to our soil was one of the notable technical advances of the war and it had continued until 1950. It is a world trend that is still continuing in many other countries, as the last FAO Report on fertiliser (issued as recently as August) shows. It will certainly be remarkable if Britain, a country that cannot grow more than a proportion of her food, now becomes unique among the nations in *voluntarily* reducing fertiliser usage. Yet this may well be the position at the end of the 1951/52 agricultural year. The sulphur shortage has seriously curtailed production, especially for superphosphate; but so far (since 1 July) supply difficulties have not been more than a theoretical factor. The demand seems lower than the acid-rationed production!

Price Reduction Unlikely

IT is too early to estimate the demand for the rest of the agricultural year. Many farmers bought heavily before the price jumps of July and they may well be using these stocks for their autumn dressings. In most parts of the country the harvest has been badly delayed by weather, and even in wartime farmers tended to defer placing orders for their future needs until the harvest in hand was in their barns. Even when allowance is made for these influences, however, the demand to date has been woefully small. Possibly some farmers believe that prices will be reduced if they persist in not buying. But this is no case for buyers to follow Mr. Dalton's gratuitous advice to housewives. No falls in price of fertiliser raw materials have occurred. On the contrary, further price rises are likely, and the allowed margins between costs and maximum controlled prices are already so slender that any severe drop in annual throughput must inevitably lead to higher prices if fertiliser production is to remain economic. Both for the industry and for technical progress in agriculture a most serious situation seems to be developing.

Technological Education

MUCH importance is rightly attached to any scheme for the improvement of technological education in the U.K. as any definite steps taken may well set the pattern for the next quarter of a century, and this is of special significance in view of the problem of how to meet the increasing world demand for experts, particularly in the field of chemistry and chemical engineering. The long-waited statement of Government policy was published last week. As the outcome of discussions and reports spread over the last six years it is a somewhat disappointing document. Generally, the policy is in accordance with the recommendations made by the National Advisory Council on Education for Industry and Commerce in its report published some 10 months ago. Creation of a technological university on the lines of the Massachusetts Institute of Technology has been turned down, at any rate for the present, on the grounds of economy. Increased financial help is to be given to selected colleges and courses, but no details are revealed yet. It is sincerely to be hoped that such grants will be adequate to enable the colleges to obtain the services of good men and that the advisory council will be strong enough to resist the claims of a large number of deserving cases. There is a serious danger that in trying to be fair, too many colleges may be raised from third to second class, while none really attain top-rank status.

College of Technology

DESPITE considerable criticism in the House of Lords from Lord Chorley and by such men of experience as Dr. D. S. Anderson,

director of the Royal Technical College, Glasgow (THE CHEMICAL AGE, *65*, 175), a College of Technology is to be established with responsibility for granting awards of associateship designed to encourage technical college students to take courses in higher technology and to provide examinations to this end. Such a decision may have been encouraged by the example of London University, which has shown what can be achieved by a strong examining body for students whom it does not undertake to teach. At the universities expansion of technology is less definite, depending to a large extent on financial resources, but the institution of post-graduate courses, usually of one year, is recommended by the University Grants Committee. Whatever party is returned to power in the forthcoming election, this important matter must not be allowed to be sidetracked. There is still a good deal that could be clarified, while Lord Hankey's suggestion for a scientific 'staff college' (THE CHEMICAL AGE, *65*, 313) might well receive further consideration.

Record Chemical Exports

DESPITE difficulties of shortages of raw materials, increasing demands of the defence programme, and problems of plant replacement, chemical exports in August reached a new level of £14,100,529, compared with £9,248,922 in the same month of last year and £6,594,864 in 1949, while also exceeding the record set up in May this year by £746,056. One of the most outstanding individual increases revealed by the *Trade and Navigation Accounts of the United Kingdom* is benzole exports of which were valued at £1,329,085 in August this year, as against £1,064 in 1950 and £316 in 1949. Overseas trade of chemicals, drugs, dyes and colours, has in fact shown a steady improvement each month this year compared with 1950, while for the first eight months of the last three years the value of exports has risen from £57,565,484 in 1949, to £65,752,158 in 1950, and £92,833,736 this year. Only a small percentage of this increase need be attributed to price increases, for these have probably been largely offset by the rise in costs of raw materials. This satisfactory contribution of the British chemical industry to the nation's economic difficulties is probably due in no small measure to the foresight which initiated some years ago programmes of research and development which are now beginning to be brought to fruition.

British Council Report

THAT controversial organisation, the British Council, has just issued its report for 1950-51. So very few people know exactly what the British Council really does besides spend money that it is reassuring to find that its activities need 120 pages of explanation in the report. Its status, however, remains rather ill-defined, as the negative definition provided in the report that 'cultural relations are primarily those which are not political, economic or military,' does nothing to clarify the situation. Oddly enough, however, science is here included in the term 'culture,' and the report gives a good record and several recommendations from abroad of the Council's work in this field. Yugoslavia is impressed with the facilities for granting her specialists entry into Britain for the purpose of specialist study, and also with the British experts who lectured in Yugoslavia during the year. A number of Spanish scientists have spent a period of training in this country subsequent to the visit last year of the Secretary-General of the Spanish Higher Council for Scientific Research, and a delegation of British scientists attended the Higher Council's 10th Annual Congress at Madrid. For many readers it will come as news that the British Council dabbles in scientific affairs. As *The Scotsman* points out, it should place itself on a more secure and informed basis at home, and it will then be better able to fulfil its function abroad with confidence and a sense of its own worth. Until then, doubts and surprises will always form part of the layman's reactions to the Council's activities.

Record Continues

United States production of crude sulphur for the first six months of 1951 continued at the record level established last year. Total output in the first half of 1951 amounted to 2,690,000 tons. Production for the full year 1950 was 5,342,000 tons.

Work of the Chemical Research Laboratory

Novel Items Seen at Open Day

ONCE again the Chemical Research Laboratory of the Department of Scientific and Industrial Research at Teddington has opened its doors to enable guests to examine new apparatus or equipment and to investigate the work that has been in progress during the past 12 months.

Interest taken in the Laboratory was evidenced by the crowd of over 300 which attended the first of the series of 'open days' held on Wednesday, 19 September. This annual opportunity for industry to gain an understanding of chemical progress and the possibilities of the practical application of various developments and processes, is becoming increasingly popular. A constant stream of visitors flowed through the rooms, gathered in groups round demonstrations of novel presentations, and asked questions of the willing staff.

Scarcity of sulphur throughout the world has obviously influenced some of the research, and experiments that offer some promise of a chemical answer to the problem were on view in the Microbiology section.

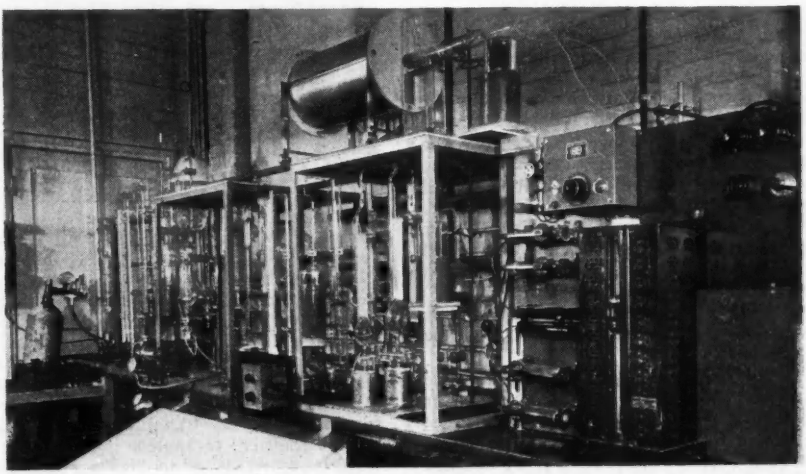
Sulphur-reducing bacteria (*Desulphovibrio desulphuricans*) in the absence of oxygen can reduce sulphates to sulphides. They are responsible for the colour of the Black Sea, for the obnoxious smells (due to the evolution of H_2S) from contaminated waters, for example canals, docks, river estuaries and wet gravel pits (THE CHEMICAL AGE, *63*, 429), and they play an essential part in the corrosion of iron pipes in water-logged soils.

Sulphide-oxidising bacteria are members of the family *Thiorhodaceae*, and oxidise hydrogen sulphide to sulphur. There are two main photosynthetic types:—

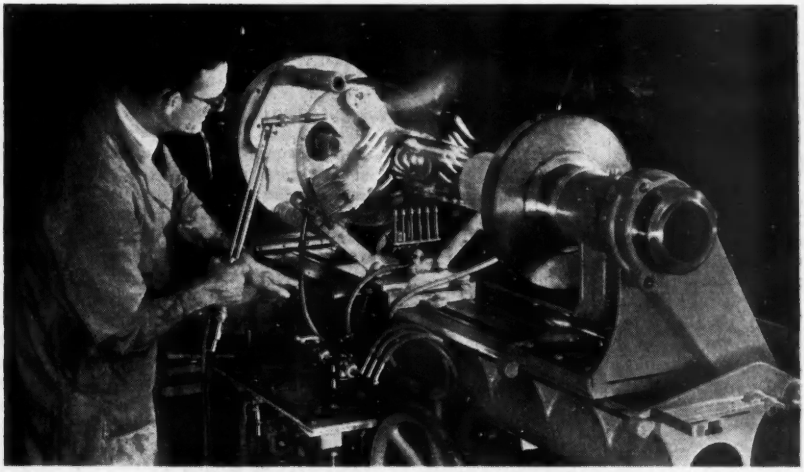
(a) Green sulphur bacteria (*Chlorobium*) which deposit sulphur outside the bacterial cell, and (b) Red sulphur bacteria (*Chromatium*) which store sulphur as globules inside the cell.

For growth they require light and strictly air-free conditions.

Sulphur-oxidising bacteria oxidise elementary sulphur to sulphuric acid in a medium free from organic carbon. In suitable conditions they produce solutions containing



Apparatus used in studying the formation and properties of thin oxide films on copper surfaces



Glassworking lathe in horizontal position

over 10 per cent sulphuric acid. The acid produced can cause destruction of vulcanised rubber hose, and the disintegration of concrete in sewers, cooling-towers, etc.

An exhibit which aroused wide general interest was connected with the survey of four lakes in Cyrenaica made by Mr. K. R. Butlin and Mr. J. R. Postgate in May, 1950 (THE CHEMICAL AGE, *63*, 329).

Situated about 25 miles south-east of El Agheila all four contained numerous sulphate-reducing bacteria. The first three were producing sulphur at a rate of approximately 200 tons annually.

Samples were brought back from the desert, and by reproducing conditions of the lakes in small tanks and test tubes, small quantities of sulphur have been produced. A flask was displayed containing sulphur sediment produced by the action of a mixed culture of pure strains of sulphate-reducing bacteria (*Desulphovibrio desulphuricans*) and green photosynthetic sulphide-oxidising bacteria (*Chlorobium* type) isolated from the Cyrenaican lakes.

The main problem remaining is to increase the rate of breeding and produce larger quantities. Experiments based on the test tube work are being increased to pilot-scale plant at Porton Experimental Establishment. It is thought that within two years the Laboratory will be able to decide whether or not the process could prove of practical application to industry.

An unusual instrument was the Warburg manometer. This is used to measure the amount of gas absorbed by suspensions of sulphate-reducing bacteria. Cells are put in a flask at the back with some sulphate or similar material and the apparatus is filled with hydrogen. When the flask is incubated, hydrogen is absorbed according to the equation $Na_2SO_4 + 4H_2 = Na_2S + 4H_2O$, and the amount of hydrogen absorbed can be measured by the pressure change registered by the gauge.

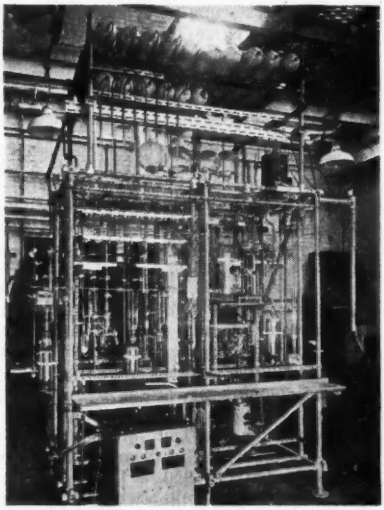
Some of the most novel presentations were to be seen in the Corrosion of Metals Group. Those which attracted considerable attention were connected with accelerated atmospheric corrosion tests. One was a totally enclosed 'Weatherometer'. Built from 'Perspex' and stainless steel this apparatus allows for the application of accelerated weathering in the form of sprays, ultra-violet light, and infra-red drying. After each weathering cycle the specimen panels are automatically turned round, so that both sides can be exposed. The annular rotating specimen rack enables the whole batch of specimens to be transferred from one 'Weatherometer' to another if desired.

Adequate resistance to high temperature flue gases and to superheated steam are problems which arise in modern power plant.

The superheater is called upon to withstand severe attack by corrosion from the products of combustion. New apparatus, designed in the Metallurgy Division of the National Physical Laboratory in consultation with the Corrosion Group, CRL, for examining oxidation of steel in flue gases was on view. Specimens of the superheater subjected to test are in the form of a short length (1.5 in.) of the tube. They are exposed for 1,000 hours to a synthetic flue gas at 625°C. After test they are examined for increase in weight, nature of scale, and adherance of scale.

A further endeavour to save sulphur was to be seen in the work of the Inorganic Group by replacement of sulphuric acid by nitric acid in the production of phosphate fertilisers.

Almost all the phosphorous required for fertiliser purposes is at present supplied by superphosphate. This is made by the action of sulphuric acid on phosphate rock and is essentially a mixture of monocalcium phosphate and calcium sulphate. The replacement of sulphuric by nitric acid is being explored, for the latter does not require imported materials for its manufacture, while the by-product, calcium nitrate, is itself a valuable fertiliser.



Distillation apparatus for sampling of low boiling hydrocarbons

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Ion exchange titration apparatus

A serious drawback is that calcium nitrate is deliquescent, which may cause the product to cake or to become damp, with consequent troubles in storage and handling. Nitric acid alone gives a deliquescent product, but mixtures of the two acids containing up to some 50 to 60 per cent of nitric, may be used.

Examples were on view of fertilisers made from the mixed acids and of 'complete fertiliser', that is one containing the three essential plant foods, phosphorous, nitrogen and potassium.

In the Radiochemical Group a new item in the control processes was demonstrated by the use of ion-exchange resins in separation processes. If a solution containing a mixture of metals is passed through a column of cation-exchange resin, the metals are adsorbed in amounts depending on their concentration in the solution and on their affinity for the particular resin used. Not only can a dilute solution be concentrated and freed from unwanted anions, but by choosing the correct conditions, the process can become selective for a particular metal.

The exhibit showed on a small scale a multicolumn adsorption system in which copper is removed from a copper-containing liquor by washing the solution with dilute sulphuric acid (elution cycle). The

flow rate and column length are so adjusted that when copper begins to appear in the effluent of column number three, column number one is saturated. Number one is then removed and eluted; number two becomes number one; number three becomes number two; and number four, already eluted, becomes number three. This 'merry-go-round' procedure is continued.

Separation of gold from platinum by paper strip separation was to be seen in the inorganic chromatography section. The solvent was ethyl acetate + dilute HNO_3. Each strip contained 1,500 μg platinum metals and 10 μg gold. Another demonstration in this section was the estimation of gold by electrolysis after column separation.

Other new items on view were:—

In the Organic Group: colour reactions for pyridine bases; fractional crystallisation at temperatures below −20°C. and −180°C.; analysis of calorimetric bomb products; and oxygen-purifying apparatus.

Among the Organic Intermediates: standard hydrocarbon samples; low temperature stills including Podbielniak 'Hyd-Robot'; and spinning-band fractionating columns.

In the Inorganic Group: purification of germanium; a 'multi-source' excitation unit; a hollow cathode source for the analysis of non-metals; and a Beckman flame spectrophotometer.

Pyrites Production in Spain

Decline Due to Obsolete Equipment

SPAIN'S importance as a source of raw materials, particularly during the present shortages, is a matter of concern to the countries of Western Europe. Most vital, owing to the world need for sulphur, is the output of pyrites, of which Spain is the largest single source of supply.

Production has fallen steadily over the last 20 years, from some three million tons in 1929 to 1,584,517 tons in 1950. Of this total, 86 per cent or 1,362,394 tons came from the British-owned mines of the Rio Tinto and Tharsis Sulphur and Copper companies situated in the Huelva province of southern Spain. About 185,000 tons went to the U.K., Western Germany bought 376,000 tons, and most of the remainder was absorbed by the domestic market.

Deterioration and growing obsolescence of mining equipment, it was pointed out in a recent article by the Madrid correspondent of the *Financial Times*, is the main reason for this reduced output.

Conditions brought about by the civil war and later World War II interfered with re-equipment. Spain's chronic shortage of foreign exchange over the last 15 years is another hindrance which has made it impossible to acquire the necessary equipment from abroad or to ensure proper maintenance of the single-track railway which links the mines with the port of Huelva. The rolling stock of this railway is liable to constant deterioration from the corrosive action of the pyrites.

Ministerial Encouragement

In an effort to improve these conditions, 'Operation P' was inaugurated at the beginning of this year, and a committee, set up by the Ministry of Industry and Commerce, was given the task of 'encouraging the production of pyrites and copper minerals'.

A scheme is now in operation under which the exporting companies are to retain a portion of their earnings in foreign currency with which to buy machinery.

A number of import licences have already been granted, but progress must depend upon the necessary foreign exchange being forthcoming, either from the Spanish authorities or as part of the U.S. financial aid to Spain which is now starting to operate.

Manpower shortages are another obstacle to increased production since mining, despite the considerable efforts being made by the present regime to improve the lot of the miner, is, as in Britain, an increasingly unpopular occupation.

Spanish consumption of pyrites is rising steadily. The new Sefanitro sulphate of copper plant near Bilbao, an affiliated concern of Altos Hornos de Vizcaya, is due to go into production towards the end of the year, and will consume from 80,000 to 100,000 tons of pyrites per year.

This increased domestic consumption, however, should not seriously affect the quantity available for export, provided that the plans of the companies of the Huelva area for stepping up production over the next four years can be realised.

Output of the Rio Tinto mines so far this year is noticeably higher than in the corresponding period of 1950. It is too soon, however, to form a reliable estimate of the over-all increase in production that will occur over the next 18 months.

The Chemical Balance

by G. F. Hodsman, B.Sc., Ph.D., A.Inst.P.
Research Laboratory, L. Oertling, Ltd.

BOTH the chemist who uses the instrument and the executive who may be responsible for its purchase, find it useful to have an understanding of the essential features of modern balance design. For the chemist who understands the construction and limitations of his balance is likely to obtain improved performance by intelligent use of the instrument and the prospective purchaser is able to make a critical assessment of manufacturers' specifications which may at first sight seem similar, except perhaps in regard to price. It is only possible here to outline some of the more important considerations involved and it is generally wise to seek the manufacturer's advice. This ensures that the most suitable instrument is obtained and that it is being used in the most efficient way.

The performance of a chemical balance is determined by its sensitivity, precision and accuracy and it is convenient to consider the design and construction of an instrument in the light of these three aspects. The interpretation and inter-relationship of these terms is a source of some confusion but they should be clearly distinguished if the capabilities and limitations of the balance are to be appreciated.

Balance Performance

The sensitivity is defined by the angle through which the beam rotates for a unit excess weight in one pan, and is determined solely by the design of the beam. The only factors which can influence the sensitivity of a balance are the length and weight of the beam and the layout of the three knife edges with respect to each other and to the centre of gravity of the beam. It is evident that sensitivity is essentially a ratio and expressions, sometimes found in specifications, such as 'Sensitivity 0.1 mg.' are meaningless. Sensitivity may, however, be expressed in a form more convenient for the chemist by multiplying the angle of rotation of the beam by the length of the pointer, or effective pointer (in the case of balances fitted with optical projection indicators) and expressing the sensitivity in terms of mm. deflection for a unit excess weight or scale divisions (of specified size) deflection for a unit excess weight. In either case the essential requirement is preserved that sensitivity is expressed as a ratio.

The precision is a measure of the extent to which successive weighings of the same mass will be reproducible and is best measured in terms of statistical concepts such as 'standard deviation'. The precision may be stated by the manufacturer but will in any case be determined at intervals by the chemist as its magnitude may vary over a period depending upon the conditions under which the balance is housed and used and also on the amount of use which the balance receives. A precision determination can readily be obtained by making a number of weighings (not less than 10 and preferably 20) of the same object, from which the standard deviation can be evaluated[1]—a procedure which can be found in most standard statistical text-books (*e.g.*, 'Theory of Statistics' by Yule and Kendall. Griffin [1950]).

Standard deviation is a better term to describe the performance of a balance than expressions such as 'reproducibility' which have a less definite meaning. For example, if a balance has a standard deviation of x mg. it may be asserted that 95 per cent of weighings will lie within a range of about $\pm$ 2 x mg. This criterion is adopted by many chemists in assessing their weighing errors and provides adequate safeguard in all but the most exacting experiments.

The quantities sensitivity and precision are complimentary in describing the performance of a balance. Clearly the sensitivity of a balance expressed in terms of scale deflection of a pointer per unit excess weight can be influenced by the length of the effective pointer used to indicate angular position of the beam and also by the linear spacing of the scale divisions themselves. Any given balance, for instance could be made apparently 'more sensitive' merely by increasing the effective pointer (or optical magnification). The precision, however, is not affected by the artifice for the increased magnification merely magnifies the errors and the uncertainty of readings remains the same. The aim of good balance design is to enable

[1] The Standard deviation is the square root of the arithmetic mean of the squares of all deviations measured from the arithmetic mean of the observations.

the chemist to achieve the full precision of which the instrument is inherently capable, without requiring any visual or vernier estimates between division lines on the scale. A semi-microchemical balance, for example, should have a sensitivity of one scale division (about 1.5 mm.) per 0.01 mg. and should have a precision which ensures that 95 per cent of the weighings of an object will lie within a range of half a scale division. Any one observation on such an instrument can always be relied upon to the nearest scale division.

The accuracy of a balance is a measure of the extent to which the mean of a number of weighings of an object differs from the correct weight. There is little point therefore in using a balance of high precision if the results are not accurate to the same order of magnitude. Precision may be regarded as influenced by random errors, including errors of observation, whereas accuracy is determined by systematic errors in the instrument or arising from the conditions of use.

The performance of a good and reliable chemical balance can therefore be summarised by reference to the three terms, sensitivity, precision and accuracy. The sensitivity should be such that the value of one scale division represents approximately the limit of weight to which observations are required while the precision and accuracy should enable reliable readings to be made to the nearest scale division.

The factors which impose limits on balance performance can now be considered together with the ways in which the balance designer seeks to improve the efficiency of the instrument.

Sensitivity

The sensitivity can theoretically be increased by increasing the length of the beam or decreasing its weight. In practice the process is limited since increasing the length of the beam can involve reduced rigidity, and a longer time period of oscillation while decrease in weight of the beam may similarly involve sacrifice of rigidity.

The sensitivity of a balance must not vary with the load in the pans and this can only be ensured provided the three knife-edges are accurately aligned. The beam therefore must not flex under load otherwise it will prove impossible to secure alignment of the knife-edges at all values of applied load and the rigidity of the beam consequently sets a limit to the increase in length or decrease in weight which is permissible. The time period of oscillation controls the weighing speed of the balance and must clearly be kept as small as possible.

The sensitivity may also be increased by arranging for the centre of gravity of the beam to lie closer to the centre-knife edge. This is a normal adjustment made by balance service engineers who rotate a small nut on a vertical spindle attached to the beam, so making small displacements of the centre of gravity. A limit is again reached since as the sensitivity is increased the time period of the beam becomes longer.

The design of a balance beam therefore represents a compromise between the conflicting factors of sensitivity, rigidity and time period and the skill of the beam-designer rests in his ability to adjust the degree of compromise to suit the changing requirements of chemical practice. It is evident, for instance, that an efficient beam design must give a uniform distribution over its area of the stresses produced by the applied loads and photoelastic stress analysis tests can be used on model beams to determine the most efficient shape. Fig. 1 shows a modern 5 in. nickel-chromium beam for a microchemical balance designed to have a sensitivity which is constant over a loading range of 0-30 g. at each end with a period of oscillation of about 30 secs., at full load.

Precision

Apart from errors of observation, which depend upon the observer, precision is limited by the knife and plane bearings, the arrestment mechanism and, where fitted, the rider system. High precision balances universally employ a knife-edge working on a plane for both the fulcrum support of the beam and for suspending the loads from the ends of the beam. For many years, agate has been used for the bearings of precision balances but tests in recent years (*e.g., Jour. Sci. Instr.*, October, 49, 341) have shown that planes cut from single crystals of corundum give a marked improvement in precision and resistance to wear. The development of synthetic crystal growing and hard metal alloys gives promise that higher precision, increased wear-resistance and higher capacities may be possible in the future.

The shape of the bearings themselves also contributes to the precision of the instrument. The planes should be optically flat and a deviation exceeding about one wavelength of light over the working surface is

not permitted on planes for use in balances claiming a precision of 0.1 mg. or better. The knife-edges should be as sharp as possible and also the radius of curvature of the edge should be constant over the working portion of the edge. If these conditions are not realised the precision is limited by the inclination of the end-planes to the horizontal which may vary due to lack of accurate positioning by the arrestment mechanism or to off-centre loading of the balance pans. The production of such edges has necessitated the development of special techniques and skills.

A frequent cause of loss of precision in chemical balances is damage to these fine edges by injudicious use of the arrestment mechanism. The importance of a smooth operation of the release lever when the knives and planes are brought into contact cannot be over-emphasised; tests show that the wear on the knife edge increases rapidly with contact speed. Similarly the presence of excessive vibration when the balance is in use can cause deterioration of the fine edge.

The arrestment mechanism is used to break the contact between knives and planes when the balance is not in use. It is designed to give a reproducible positioning of the end planes on their knife edges and also to minimise the possibility of sticking between the stirrup and the arrestment

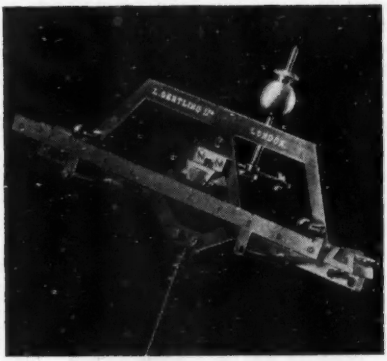


Fig. 1

mechanism—a frequent cause of trouble when balances are not housed under ideal conditions. On balances designed for the highest precision, a kinematic arrestment, as shown in Fig. 2, is used; the support points are of agate and engage in jewel bearings,

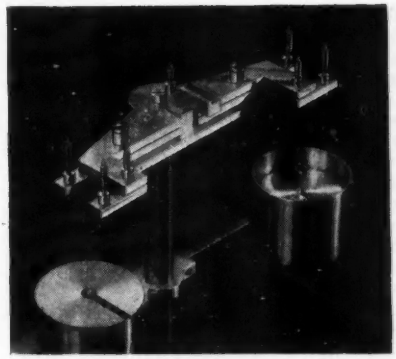


Fig. 2

fitted to the beam and stirrups. In this way reproducible positioning is achieved with a design which is basically quite simple. Since the jewel bearings are inverted on the beam, they are not likely to accumulate dust easily and the risk of sticking is minimised.

The rider principle involves inherent limitations on precision due to uncertainty in the location of the rider, relative to the beam. The errors are not likely to be serious on analytical balances but on balances claiming microgram precision, the form of the notches in the rider-bar requires special attention as does also the design of the rider itself, to ensure reproducible positioning. An error of 20 micron in the position of the usual 5 mg. rider is sufficient to give an error of one microgram in the reading of a microchemical balance.

Accuracy

Limitations on accuracy may be either inherent in the instrument or arise from the conditions under which it is used. The balance compares moments rather than weights and it follows that equality between two equal weights will only be indicated when they are suspended at equal distances from the centre knife edge. This requirement necessitates a most delicate location of knife-edge positions even on analytical balances where the equality of arm length should be within one part in two million if the instrument is to weigh 200 g. accurate to 0.1 mg. In practice this limit is rarely achieved or considered necessary and arm-length equality of a few parts in a million is the normal tolerance permitted on a good analytical balance. Nevertheless, even

these limits call for a high degree of skill by the balance adjuster who must set the knife-edges to within a few millionths of an inch. The knife holders must be designed so that the knives, once adjusted, shall not move by more than a similar amount under all conditions of normal use.

The weights used with the balance constitute an obvious limitation to weighing accuracy. In many cases the chemist prefers to inter-calibrate his own weights so that apart from absolute values, they at least constitute

Fig. 3

a self-consistent series. If in addition it is possible to compare any one weight with a standard weight, then the set becomes completely calibrated. Balances fitted with self-contained weights have become popular in recent years; the weights are made from stable and corrosion resistant metals, are often protected from dust, and due to the method of manipulation, are subjected to little wear. Such balances, Fig. 3, are usually more expensive but give quicker weighings and minimise the number of weight calibrations required.

Stability of rest-point and sensitivity provides a further limitation on accuracy. In many operations, it is inconvenient to check the unloaded rest-point of the balance before and after every weighing and it is common practice to make this check at much less frequent intervals—which can only be determined by experience—and the sensitivity of the instrument may only be checked very infrequently. Under such conditions it is essential that the stability of the instrument can be relied upon to within the accuracy required of the weighing. The stability can be impaired by fluctuations of temperature and although the manufacturer takes precautions to minimise these effects it is desirable to give the balance the best invironmental conditions possible, when weighings of the highest accuracy are required. A micro-chemical balance, Fig. 4, should have the beam isolated from the weighing compartment, to prevent convection currents disturbing the beam when the case is opened.

Variations in air density may limit weighing accuracy by causing buoyancy variations, for the balance only compares the forces exerted on each end of the beam. The downward force on the beam due to the object in the pan is reduced from what it would be *in vacuo*, by the weight of the air displaced by the object. This is proportional to both the volume of the object and the density of the air. If the objects in each pan are of the same density, then no trouble will be experienced at different air-densities since the effect will be equal on both sides of the balance. If, however, the density of the objects in each pan is different, then the apparent poise of the balance will change as the air-density changes and a buoyancy correction may have to be applied. In certain work where a small sample is

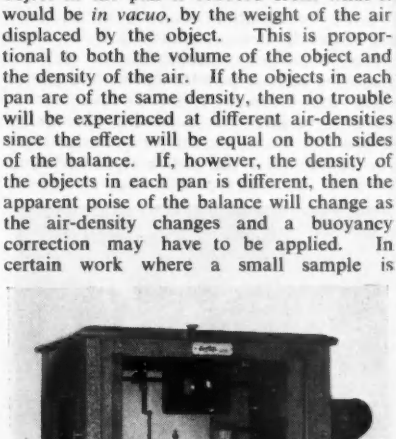


Fig. 4

weighed in a large container it may be adequate to counterpoise the container with a vessel of like density and the buoyancy correction may be avoided.

The factors which influence the sensitivity, precision and accuracy of the chemical balance have been reviewed together with the refinements incorporated in the instrument, to ensure that it shall have a high weighing performance. However, new developments in chemistry bring new demands for higher precision and greater sensitivity, together with quicker weighing speeds.

Two recent developments point possible ways in which the balance may evolve. The constant-load balance weighs by substitution, the weights being removed from a carrier suspended from the same knife-edge as the object pan. Only two knife-edges are used and errors associated with arm-length and variations of sensitivity with load cannot arise. The weights are manipulated by control knobs and such instruments are capable of high weighing speeds. On the other hand, counterpoising of objects which differ in density from the weights, is not possible. The constant-load balance should be carefully distinguished from the 'single-pan' balance which is in effect only a conventional balance fitted with weight manipulators.

The quartz-fibre microbalance which is claimed to be capable of weighing to 5×10^{-9} g. has been developed for use in atomic energy work but may ultimately, in modified form, find wider applications. The beam is made from fine quartz fibres and is supported on a central quartz torsion-fibre. The instrument combines some of the features of the equal-arm lever balance and the torsion balance.

Whether balance design in the future moves in either of these directions or in further refinements of the conventional balance remains to be seen. It is, however, certain there can be no relaxation of the high standard of precision engineering which has given the modern chemical balance a place among the most accurate and reliable scientific instruments.

$LiAlH_4$ Explosion

American Workers' Recommendations

A SEVERE explosion while using the useful organic reducing agent, lithium aluminium hydride, in the reduction of fluorine-containing compounds, has recently been reported from America. The experience in question, reported by *Chemical and Engineering News*, concerned the reduction of perfluorosuccinamide to the diamine, using $LiAlH_4$ in ether. The succinamide was added to the ether solution of the reducing agent under an atmosphere of nitrogen—gentle refluxing indicated that reaction was proceeding—and when hydrolysis of the mixture was attempted by adding water dropwise in the usual way, on addition of the second drop there was a violent explosion that powdered the reaction flask cleaved the metal ring stand at the base, and started an ether fire, also badly injuring two research workers.

Other workers in America have previously reported that explosions have occurred when reactions involving aluminium hydride and related compounds were carried out in ether containing CO_2, but during the experiment described the ether had been standing for some time over sodium and had in fact been used successfully for other fluorochemical reductions. Moreover oxygen—another possible cause of explosion—was found to be present only in the expected trace amounts in the nitrogen used.

Form an Unstable Complex

The explanation is believed to be that the hydride and the diamide form an unstable complex. In fact a solid complex has actually been isolated in small amounts from a reaction mixture and shown to detonate at room temperature. In the experiment it appears to have been stabilised by the pressure of ether, since when the ether was evaporated from the reaction mixture at room temperature the explosion occurred again.

Subsequent small scale reactions have shown that trifluoroacetic acid, perfluorobutyramide and perfluoroadipamide also form detonating complexes with the hydride, although to a far lesser degree, heating on a hot plate being necessary before explosion occurred. The deep-seated nature of the decomposition, however, was shown by the appearance of free carbon.

The workers recommended that all $LiAlH_4$ reductions of fluorochemicals be carried out behind barricades, and that where unstable complex formation may be suspected, the reaction be carried out on a very small scale (0.5 g.) with a qualitative determination of the stability of the complex by evaporation of the ether and heating.

Potash Discovery in Canada

POSSIBILITY of Saskatchewan becoming the world's third largest producer of potash with the prospect of an unlimited market may follow the discovery and quiet development of a vast deposit at Vera, 15 miles northwest of Unity.

An experimental plant has been opened to recover potassium chloride from the thick layer of salt in which it is embedded, utilising a revolutionary method of separating the minerals by circulating water through shafts where the salt is dissolved from the chloride. The separation is completed when the solution is pumped to the surface and cooled.

The Vera field, being worked by the Western Potash Corporation, is believed to be almost unlimited as a potash producer. Engineers estimate that it extends at least 12 miles deep but its width has not yet been measured. Further shafts will be sunk shortly to determine its exact size. The salt bed is 3,450 ft. deep and 435 ft. thick. The potash deposits are near the top of the field in a broad band containing 35 per cent potassium chloride to 65 per cent salt.

One square mile of the deposit, 10 ft. thick, holds about 6,500,000 tons of potassium chloride. On the basis of present Canadian consumpton of 100,000 tons a year, one square mile would provide a 65-year supply for the domestic market.

Control Instruments Plans

PLANS to extend its Scottish factory were announced recently by Mr. H. W. Sweatt, president of the Honeywell Regulator Company of America, at a Press conference in Glasgow. Mr. Sweatt, who was on a visit to the British subsidiary, Honeywell-Brown & Co., Ltd., Blantyre, Lanarkshire, expressed his satisfaction at the progress made since the factory opened two years ago, and his pleasure at the high standard of Scottish workmanship.

Instruments for the control of high temperatures in chemical plants, refineries and steel works were already being produced, some being shipped to the U.S.A. It was intended to introduce a further range of instruments for which it was believed there was a good market in the sterling area.

The factory at Blantyre at present covered 30,000 sq. ft. The expansion proposed, if sanctioned by the Board of Trade, was for a further 15,000 sq. ft., which would enable the present labour force to be doubled.

Argentine Chemical Industry

DEVELOPMENT of the Argentine chemical industry is revealed in figures recently published by the Government.

Local production of caustic soda, which is planned to reach 40,000 tons this year, still falls short of requirements, but imports declined from 52,000 tons in 1948 to 14,000 in 1949. Glycerine, tartaric acid, oxide of magnesium, sulphate of baryta, lactic, acetic, sulphuric, chlorous and nitric acids are all manufactured in sufficient quantities to supply the local market, while a surplus of the two first-named is available for export.

Production of citric acid amounts to 150 tons, or three-eighths of local consumption, and additional factories are being installed in accordance with the Five-Year Plan. The output of carbonate of soda has reached 25,000 tons, or half the quantity consumed in the country. Out of Argentina's requirements of essential oils 30 per cent are being met locally.

Register of Industrial Premises

IT was announced by the Board of Trade on 29 July (Trade Press Notice No. 159) that the Government had decided to create a small organisation under Sir Philip Warter within the Board of Trade which would be responsible for the establishment of a Control of Factory and Storage Premises in the event of an emergency. This organisation is now the Factory and Storage Premises (Defence Planning) Division.

As one of its first tasks the Division is bringing up-to-date its register of industrial premises, and industrialists throughout the country will shortly be receiving from Board of Trade Regional Controllers a letter asking them to supply certain basic information about their premises.

By limiting the approach to firms occupying a floor space exceeding 5,000 sq. ft., and omitting those industries which are already heavily committed to the rearmament programme, only about one-third of the industrialists throughout the country will be asked to complete a short questionnaire.

Industry has been assured that the information obtained by the Board of Trade through this appeal will be regarded as strictly confidential.

Source of the 'Glow' in Crystals

Caused by Escaping Electrons

ACCORDING to a report from the University of Wisconsin News Service, the secret to an old chemical mystery—crystals that glow in the dark when heated—has been solved by the University's scientists. The discovery is said to have opened up entirely new fields of research and application in chemistry, geology, mineral prospecting, and in the development of a practical radiation dosimeter—the type of gadget that can be used as a dog tag to measure the amount of radiation to which individuals are exposed during an atomic bomb blast.

The study of crystals that glow was conducted by Dr. Farrington Daniels, professor of chemistry, Donald F. Saunders, project assistant, and other Wisconsin scientists. The research was conducted under an Atomic Energy Commission grant.

The workers found that the glow given off by certain mineral crystals when heated is caused by electrons escaping from 'traps' in the lattice-like structure of the crystal. The electrons are driven into the traps by radioactivity either from very small amounts of natural radioactive substances or by man-made radiation in the laboratory. When the chemical crystal is heated slightly, the electrons escape the traps and fall back to their normal positions, emitting light in the process.

Phenomenon Common

It was found that the phenomenon is much more common than had previously been realised, and practically all limestone and granites will emit light when heated. A few prospectors have known for years that some minerals will glow for a moment when heated, but it was not known that small amounts of uranium and thorium furnished the radioactivity necessary for the trick. Because of the small amounts of these elements present in most materials, centuries are required for the trapping of enough electrons to give a few seconds' glow. During an atomic bomb blast the radioactivity would be so intense that crystals of lithium fluoride, for example, would trap sufficient electrons in a few seconds to glow when heated.

The University of Wisconsin workers have designed a thermoluminescent apparatus to heat the crystals and record the amount of light emitted. Use of such a device could enable authorities to quickly divide a population exposed to radiation into groups of individuals requiring similar medical treatment.

'For laboratory experimentation, for health protection of those who work with radioactive materials and X-rays, and for defence against atomic warfare, it is necessary to have simple, rugged radiation dosimeters which will give a measure of the accumulated exposure of gamma radiation,' Daniels and Saunders say in a report just completed for the AEC.

Individual Pattern

After thermoluminescent crystals have been heated once, the ability to glow is destroyed, but it can be restored by exposure to radiation.

Each mineral has its individual 'glow' pattern. When heated at a rate of one degree a second, the intensity of one light varies noticeably with the type of mineral and its geologic history. And each type has peaks and dips in brightness which are characteristic of the type.

The research team, working with University of Wisconsin geologists, E. J. Zeller and J. M. Parks, found that it is possible in some cases to estimate the age of limestone and fluorite deposits by use of the thermoluminescent apparatus. There is hope that dating of material by the new method may be extended to other types of rocks and even to some archæological materials.

'The realisation that the thermoluminescence of rock is due to the presence of uranium and thorium led in turn to field explorations in North-Western Canada and to a new theory for the geo-chemical concentration of uranium in granites and to the use of the method as a stratigraphic tool,' the scientists report.

Working with another geologist, R. C. Emmons, an expert on the history of granite formations, the scientists hit upon a theory of uranium concentration which may be of value in geo-prospecting for the vital metal. By studying the glow produced by

various uranium-bearing ores when heated, they found that the uranium was apparently concentrated in granite formations known as lamprophyre dikes, and that these dikes, or cracks, were formed late in the history of the cooling of the granite formations.

Another use for the thermoluminescent capacity of minerals may be found in the field of oil exploration. The samples of limestone taken from various depths of one drilling, for example, can be compared with samples from other wells to aid in predicting whether or not the same oil-bearing strata are present.

It is also believed that it may be possible to develop methods of exploration for uranium using the 'glow' technique. Their studies of low-grade uranium deposits may even provide suggestions for the recovery of uranium from ores which are at present considered too poor to be of value.

Professor Daniels said the research at the University of Wisconsin is continuing under the AEC sponsorship, and that these and other possible uses for the new method are to be explored.

Expansion of Interests

Powell Duffryn's New Ventures

IMPORTANT expansion of its interests in the oil marketing industry and the problems caused by the vesting of its colliery assets are referred to in his statement for the year ended 31 March, 1951, by Sir Herbert Merrett, chairman of Powell Duffryn, Ltd.

'In these days of unprecedented revolution and political interference,' he said, 'it is unnecessary to refer to the anxieties and setbacks which encounter those who have to direct the affairs of companies such as yours, but I can assure you that, with a background of hard experience, we shall not fail in our determination to defend your interests and utilise your assets to best advantage. The reward of success is now little more than the satisfaction of accomplishment, and the support and encouragement received from those who have the power to help is very meagre. Yet the urge of free industrial enterprise stimulates unstinted effort'.

When the company's colliery assets were vested (Sir Herbert reported) it had embarked upon new ventures. It was inevitable therefore that there would be a period during which investments would yield no income and development losses would have to be met. A policy had therefore been adopted of moderate dividend and a build-up of the carry-forward of the profit and loss account with the intention of using accumulated profits to cover such a contingency. This was in fact now being experienced.

The most important event had been the company's expansion of investments and direct interest in the oil marketing industry, and its 50 per cent partnership with the Socony-Vacuum Oil Co., Inc., of New York, in the British company, Vacuum Oil Co., Ltd.

Construction of the refinery at Coryton had proceeded almost to schedule despite many difficulties. Amplifications had been made to the original scheme, the chief being the incorporation of a catalytic cracking unit. Cost of this new plant and other additions could not be estimated at this stage.

It had been decided, however, that Powell Duffryn and Socony-Vacuum should each be prepared to provide another £1,750,000 between now and the end of 1952. This was the reason for the increased authorised capital of the Vacuum Oil Co., Ltd., which now stood at £12,500,000. Of this amount £6,830,358 had so far been issued—half being held by the British and half by the American company.

Production at the Hayes factory of Powell Duffryn Carbon Products, Ltd., was now improving. Trading losses had occurred at first as was to be expected in an industry of such a technical nature.

New American Company

Sales were satisfactory and the quality of goods first-class. Manufacture and trading had recently been extended by the formation of a company in the United States jointly with the American company the Great Lakes Carbon Corporation. This new company, which represented a fifty-fifty partnership, was called 'The British-American Carbon Corporation'. Through it, it would be possible to enter the American market without the difficulties which would be met in an attempt to export goods directly from this country.

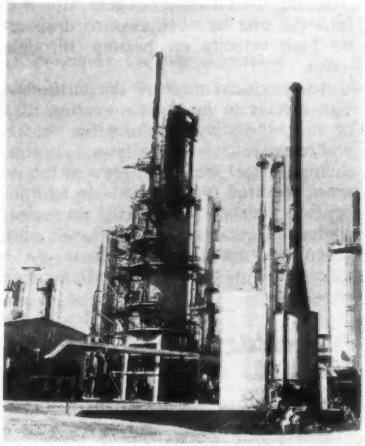
The annual general meeting of Powell Duffryn, Ltd., will be held at the May Fair Hotel, London, on 10 October, 1951, and will be followed by an extraordinary general meeting at which it will be proposed that the share capital be increased from £14,160,470 to £16 million by the creation of 1,839,529 ordinary shares of £1 each.

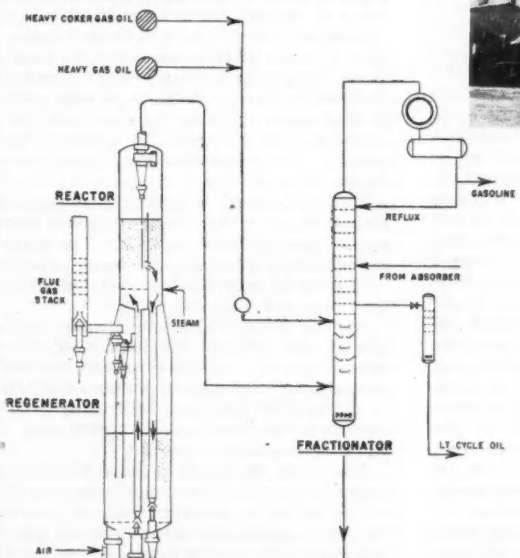
Orthoflow Fluid Catalytic Cracker

THE photograph of the completed converter and the diagram show some of the construction and internal details of the first Orthoflow fluid catalytic cracker, recently put on stream at Edmonton, Canada, for the British American Oil Co., Ltd., by the M. W. Kellogg Company, refinery and chemical engineers of New York City. The unit, designed by the American firm, was erected by its subsidiary, The Canadian Kellogg Co., Ltd.

A small unit in comparison with the 45 or more familiary side-by-side fluid crackers which Kellogg has engineered and erected, this Orthoflow is designed to process about 2,000 barrels per day. The Orthoflow design, however, is not restricted to small throughput. Kellogg is currently building two more with capacities of over 8,000 barrels per day and has designed—for the purpose of engineering study and cost comparison—units capable of processing more than 60,000 barrels. According to Kellogg, there are no apparent mechanical or process limitations which would restrict the usage of this type of design. And the cost picture naturally improves in larger installations.

Aside from the fact that the Orthoflow is a single-vessel unit containing chambers for reaction, regeneration and stripping, the most important design innovation is seen in the straight-line catalyst carrier lines which are within the vessel. The lines will be (it is said) much less subject to erosion by high velocity catalyst than bent lines. Another





Above: The converter of the Orthoflow fluid catalytic cracker. Left: Its construction and internal details

economy and low-maintenance feature of the design is the elimination of expansion joints in the lines.

To absorb the natural thermal expansion of the carrier lines, the specially designed catalyst-and-oil-flow control valves have been spring-loaded. The valves themselves are quite a deviation from the slide valves which control the flow in the majority of fluid crackers erected to date. In essence, they are large needle valves through which catalyst and oil are introduced to the carrier line leading to the reactor. Hot catalyst from the bottom of the regenerator is drawn into the line by the pressure drop created by high velocity oil passing through the valve.

Another advantage of the Orthoflow design is said to be the elimination of much of the supporting structure for the reactor and regenerator. This allows a considerable saving in steel work and reduces the overall space required for the unit. In addition, all control points, particularly the valves for control of catalyst flow, although normally automatic, are low enough to be easily accessible to operating and maintenance crews.

Brazilian Plastics

Restrictions & Raw Material Difficulties

UNTIL 1939 the use of plastics in Brazil was restricted to articles made of celluloid and bakelite. Practically all were imported and the great majority consisted of cheap toilet articles and fancy goods. In that year polystyrene and vinylite appeared for the first time on the Brazilian market, and created a demand for a variety of useful, as well as non-essential articles. Supplies from abroad ceased abruptly, however, on the outbreak of war as imports were drastically curtailed. When hostilities ended and peace-time production was resumed the market became flooded with plastic goods of every description. Some 80 per cent came from the U.S.A. and the remainder from Britain.

The Prior Licence Law of February 1948 restricted imports of all non-essential articles and the local industry, hitherto unable to compete with foreign manufacturers, was encouraged to increase the volume and range of production, in order to meet the new demand.

By 1950 there were 132 firms producing plastics in S. Paulo, the principal centre of the industry, and many others had opened in the Federal District. The number of factories, their output and the variety of goods produced are still increasing. Local rayon manufacturers are supplying raw materials to textile mills and pneumatic tyre factories. Local production now caters for plastics in many forms for domestic, medical and electrical purposes and for industrial applications. Since 1946 imports of manufactured plastics have decreased by 60 per cent, but imports of synthetic and natural resins, to be made up locally, have increased in value by more than 100 per cent.

Difficulties Encountered

Many difficulties were encountered by the new industry. Raw materials and equipment had to be purchased abroad, import licences were issued reluctantly and skilled labour was in short supply. By-products of coal and petroleum are now produced locally and larger supplies will be available when the oil refineries, at present under construction, begin operating.

The first polystyrene factory, inaugurated at S. Paulo in 1949, has recently increased capacity to 4,000 tons and a third automatic line will be brought into service this year. Production already exceeds local consumption, leaving a 30 per cent surplus for export to neighbouring republics. Styrol monomer must still be imported, but a German group is now reported to be negotiating for the installation of a factory to produce this essential raw material from petroleum in S. Paulo.

A well-equipped factory in that state is manufacturing a large variety of goods from polystyrene produced locally. The range includes toys, domestic and fancy articles, containers for laboratory products, electrical apparatus and insulated wires.

Another firm produces anti-corrosive tubes and sheets, 'polifex' or plastic leather for upholstery work, materials for awnings and garden hoses, while the Brazilian subsidiary of the Koppers Company is building a factory in S. Paulo to produce 1,500 tons of polystyrene plastics annually.

Quality of the goods produced in Brazil is improving rapidly, although in some cases, but by no means in all it is still inferior to that of imported products as regards finish and durability. Prices, generally, are high, as the market is still too restricted for mass production, but it is expanding rapidly.

Education in Technology

Government Approval for College of Technologists

THE long-awaited statement of Government policy on higher technological education was announced last week in a White Paper (Cmd. 8357, HMSO, 3d.). Any proposal for the establishment of a technological university either by setting up an entirely new foundation or by a large expansion of some existing institution has been rejected for the time being.

A new centre of this kind, which should cater for at least 2,000 to 3,000 students, would involve a capital outlay probably exceeding £6,000,000. Planning and building would take at least five or six years, and while diverting large resources which are urgently needed elsewhere, it could give no return in the form of new graduates during the next 10 years at least. To proceed by the expansion of an existing institution would also involve heavy capital cost and building commitments and here again no rapid return could be expected.

While available resources of manpower, accommodation and equipment are so straitened the Government considers that to attempt any such project at the present time would not be in the national interest. The matter will, however, be reconsidered on its merits when the situation improves.

In its report last year the National Advisory Council on Education for Industry and Commerce recommended that increased financial assistance should be given to the colleges engaged in advanced technology, that new courses should be developed in technical colleges in close association with industry, and that a Royal College of Technologists should be established.

Selected Colleges

Details of its proposals for making improved financial assistance available for selected colleges and courses, the Government states, will be announced shortly.

It is proposed to arrange for the establishment of a College of Technologists with responsibility for the granting of awards of associateship and so on. This would be mainly designed to encourage technical college students to take appropriate courses in higher technology but without, at the first stage at any rate, any other responsibilities other than the granting of these awards and the approval of courses for such a purpose.

A Royal Charter would be sought, but the right to use the title 'Royal' would not be requested at this stage.

Proposals for the universities are far less definite, depending as they do to some extent upon the estimate now being discussed by the University Grants Committee for its next quinquennial period which begins with the start of the next financial year.

Numbers Greatly Increased

In the university field, the numbers of full-time students in technology have increased from 5,288 in 1938-30 to 10,933 in 1949-50, and those of post-graduate students from 662 to 1,539. The University Grants Committee has provided funds for increasing both teaching staff and technical assistance and has made non-recurrent grants for the erection of new buildings and the purchase of new equipment. In addition to the new buildings which have been completed or are in course of construction, much building is still needed in order to provide adequately for present student numbers and for increased facilities.

Undergraduate courses in this country normally last three years, but in the U.S.A. and on the continent instruction for the more advanced students usually extends over five or more years. As a first step towards providing longer courses here, the University Grants Committee is encouraging a few universities to institute post-graduate courses, usually of one year's duration, in particular fields of technology, including civil, mechanical, electrical, chemical and agricultural engineering, metallurgy, mining and textiles.

Students resorting to these courses are for the most part graduates in technology, who have spent some two years in industry after taking their degree. The number of places will be increased, and further courses will be set up as and when resources can be made available for new building and for the engagement of additional staff as required.

The universities are properly concerned with the more fundamental aspects of technology and unversity departments in technology must, therefore, be in close association with strong departments of pure science.

OVERSEAS

Soda Ash Subsidy

The Indian Government has cancelled the subsidy to the domestic soda ash industry, on the recommendation of the Indian Tariff Board. The rates of duty on soda ash have been cut to 30 per cent *ad valorem* preferential and 40 per cent standard. India's current output of soda ash from her two plants amounts to about 45,000 tons per year and goes to the glass, paper and textile industries. Total annual requirements run at about 130,000 tons, the balance being met by imports.

Canadian Phenol Plant

A process expected to produce about 9,500 tons of phenol and acetone annually is to be used at the new $750,000 Montreal refinery of B.A.-Shawinigan, Ltd. This process uses cumene as raw material which will be obtained from gases from the propylene refinery owned by the British-American Oil Company. The cumene is oxidised in corrosion-resistant vessels to a hydroperoxide, concentrated, and made to undergo a special cleavage reaction which separates the phenol and acetone under controlled chemical conditions. The products are expected to make Canada self-sufficient in both these valuable chemicals.

Strawberry Weedkiller

Another chemical weedkiller on the market in America, this time protecting strawberries and marketed by the California Spray-Chemical Corporation, is *iso*propyl-*n*-phenyl carbamate (IPC). This is claimed to kill weeds, but leave the broad-leaved strawberries unaffected. The residual life of the insecticide is about six weeks, and as it is destroyed by the sun's heat it does not accumulate in the soil.

Brazil Develops Rubber

Sao Paulo industrialists in Brazil are organising a new company, Plantacoes Brazileiras S.A., with a capital of 100,000,000 Cruzeiros, for the large-scale production of rubber by modern methods. The company's plans provide for the establishment of plantations in the Acre Federal Territory in the Amazon region and in the States of Bahia, Matto Grosso and Sao Paulo.

'Teflon' Stopcock

The fluorine plastic 'Teflon' is being used in America for the manufacture of a stopcock that needs no lubricant. The unique non-frictional properties of this plastic ensure that the stopcock does not freeze up in strongly alkaline or corrosive conditions, or seize up through dissolution of the tap-grease. The stopcock is being marketed by the Kontes Glass Co.

New Venezuelan Factories

Two new factories have recently commenced production in Venezuela: a nylon plant in Caracas and a match factory operated by the Fosforera Venezolana C.A. This will be the first time that Venezuela has been able to produce her own matches. It is expected that the subsidiary factory which the Celanese Corporation of America recently established at Valencia will be completed by next year, when it should be able to produce nearly 3,000 tons of synthetic yarn a year. At a later stage it may produce industrial chemicals from petroleum.

Nitric Acid Plant for Israel

The Israeli Government has placed an order for a complete nitric acid plant with a French engineering firm. The plant, which is part of the Government's plan for establishing a chemical industry, is to be erected at Haifa at an estimated cost of over 200,000,000 francs and will contribute mainly to the production of artificial fertilisers.

Rainmakers' Licence

People intending to tamper with the weather in future in America will have to go through the same qualifying procedure as any other citizen trying to get a few initials after his name. California has just passed a bill requiring a state licence and a $50 fee from all persons attempting to cause or prevent rain or snow, and has ordered them to confine their activities to a specified area and time, publish notices of their intentions, and report results to the State Division of Water Resources, which is starting to keep a tally on rainmakers. Similar legislation is expected for the whole country.

PERSONAL

At a meeting of the board of directors of The Power-Gas Corporation, Ltd., held in London on 19 September, it was announced that the managing director and vice-chairman, DR. N. E. RAMBUSH, D.Sc. (Hon.), M.I.Chem.E., had been elected chairman of the company. The vacancy was caused by the retirement of MR. WILFRED BESWICK, who had been chairman since 1939.

Dr. N. E. Rambush

Dr. Rambush joined The Power-Gas Corporation, Ltd., in 1918 as chief engineer. Nine years later he became technical manager, and in 1931 was appointed general manager to the Power-Gas group of companies. He became a director of Ashmore, Benson, Pease & Co., Ltd., in 1933, and in 1939 was appointed managing director of The Power-Gas Corporation and its subsidiaries, having been joint managing director with Mr. Beswick during the preceding year. Dr. Rambush has been vice-chairman since 1947.

His book, 'Modern Gas Producers', published in 1923 still has world-wide recognition as one of the major works on the subject and in June, 1948, in recognition of the distinction of his work in the application of Science to the gas industry, he was awarded the degree of D.Sc. (*Honoris Causa*) of Durham University.

Although the head office of The Power-Gas Corporation Ltd., is at Stockton-on-Tees, the group have a controlling interest in the well-known firm of Rose, Downs & Thompson, Ltd., of Hull, and own overseas subsidiaries in South Africa, Australia, France and Canada.

The United Sulphuric Acid Corporation announces that MR. E. A. GOODLAND, B.A., M.Inst.F., M.Inst.Gas E., A.M.I.Chem.E., A.M.I.I.A., has been appointed general manager from 1 September. Mr. Goodland leaves the post of manager of the Walsall District, West Midlands Gas Board, to take up this appointment. From 1945 until the gas industry was nationalised in May, 1949, he was assistant manager of the City of Birmingham Gas Department.

Mr. Goodland was educated at Taunton School and Drax Grammar School, then at St. Catharine's College, Cambridge, where he obtained Honours in the Natural Sciences Tripos, followed by a post-graduate course in chemical engineering at University College, London. He joined the United Steel Companies, Ltd., as a college apprentice on leaving University College and later held positions in that company as fuel engineer at Workington and later as coke oven manager at the Appleby Frodingham Steelworks at Scunthorpe.

During recent years Mr. Goodland has played an active part in a number of technical and professional societies, having been committee member of the Midland Sections of the Institute of Fuel and the Institution of Chemical Engineers, and a member of council of the Birmingham centre of the Institute of Industrial Administration.

It has just been announced that MR. P. K. STANDRING has been appointed chairman of the Dyestuffs Division of Imperial Chemical Industries, Ltd., and MR. C. PAINE has been appointed a managing director of the Division (jointly with MR. H. JACKSON). The appointments were made with effect from 13 September.

Mr. Standring was born in Heywood, Lancashire, and is still resident there. He was educated at Manchester University and gained an honours degree in chemistry there. He then spent a year with the Ministry of Munitions. He came to Levinsteins, Ltd., Blackley, on 1 July, 1917, where he was posted to the research department under Mr. J. Baddiley. In December, 1917, he was transferred to Ellesmere Port and was there for fifteen years. In 1931 he was made works manager at Ellesmere Port and in 1937 works manager at Blackley. In January, 1944, he was made a director of the Dyestuffs Division; in 1945 joint managing director and this month he has been appointed chairman of Dyestuffs Division. He was acting chairman for a few months immediately before this last appointment.

Mr. Paine started in 1917 with Levinsteins, Ltd., at Blackley, as a research chemist and continued as such until 1934. He was in the patents department for two years and was then seconded to I.C.I. (New York). He rejoined the research department in 1938 and was made assistant research manager in 1942 and research manager in 1943. He was made director of I.C.(P.), Ltd., in 1944, research director of Dyestuffs Division in 1946 and joint managing director this month.

Levinsteins, Ltd., became part of the British Dyestuffs Corporation, Ltd., in 1919 and this corporation, together with Brunner Mond & Co., Ltd., Nobel Industries, Ltd., and the United Alkali Co., Ltd., were merged to form I.C.I. in 1926.

DR. E. C. ROLLASON, M.Sc., Ph.D., F.I.M., formerly a delegate director and research manager of Murex Welding Processes, Ltd., will take up his appointment to the Henry Bell Wortley Chair of Metallurgy at Liverpool University on 1 October, 1951.

On leaving the company he was presented with an inscribed silver salver on behalf of the staff by LT.-COL. J. F. TODHUNTER, general manager, who, after paying tribute to the work which Dr. Rollason had done, stated that it was not only a compliment to Murex but to the welding industry as a whole that Dr. Rollason had been selected for his new appointment.

Dr. Rollason, who is 43 years of age, was educated at Dudley Grammar School, Dudley Technical College, and Birmingham University, graduated with a B.Sc. degree in 1930 and was awarded the degree of M.Sc. in 1932. While at the University he was successively awarded the Wiggin Metallurgical Scholarship (1928), the Tertius Collins Prize (1929) and the Metallurgical Society's Vice-President's Prize (1930).

After some years in industry, Dr. Rollason was appointed senior lecturer in the Department of Metallurgy at Birmingham University in 1935, and in 1940 he was seconded to Murex Welding Processes, Ltd., to carry out important war research work, later becoming a delegate director and research manager of the company.

In addition to serving on the Research Board of the British Welding Research Association, Dr. Rollason served on a large number of committees in industry, including those of the British Standards Institution, the Institute of Welding, BWRA and BISRA. He was a member of the Armour Welding Committee of the Fighting Vehicle Design Department of the Ministry of Supply, and also a British Delegate for weldability on the International Institute of Welding.

Dr. Rollason is to be succeeded in the position of research manager at Murex Welding Processes, Ltd., by DR. W. I. PUMPHREY, M.Sc., Ph.D., F.R.S.A. Dr. Pumphrey was at Birmingham University where he graduated with a B.Sc. degree in 1942, and began work at the National Physical Laboratory on problems associated with the heat treatment of steel. In 1944 he was awarded the degree of M.Sc. for work on the hardenability of steel.

Dr. Pumphrey left the NPL in 1945 and became leader of the welding research team of the Aluminium Development Association at Birmingham University. Here he worked on problems associated with the welding of aluminium and its alloys, and was awarded a Ph.D. degree in 1948 for this work. In 1949 he was awarded a Commonwealth Fellowship and spent 14 months in the United States, studying the application of the results of metallurgical research in industry. While in the U.S.A. he was awarded a Diploma in Business Management.

Dr. Pumphrey is the author of a large number of papers on metallurgical subjects and has been a guest speaker to metallurgical audiences in Britain, France and the U.S.A. He is a Fellow of the Royal Society of Arts, a member of the Iron and Steel Institute, of the Institute of Metals and also of the North Wales Metallurgical Society.

The Lord President of the Council has appointed PROFESSOR SIR ERIC RIDEAL, F.R.S., to be a member of the Advisory Council for Scientific and Industrial Research from 1 October, 1951.

Sir Eric Rideal is Professor of Physical Chemistry at King's College, London. He was Professor of Colloid Science, Cambridge University, from 1930 to 1946, and Fullerian Professor of Chemistry and Director of the Davy-Faraday Research Laboratory at the Royal Institution from 1946 to 1949. He is 61 years of age.

PROFESSOR H. W. MELVILLE, F.R.S., retires from the Council on 30 September, 1951, on completion of his period of service.

Publications & Announcements

SINCE 1923, the Institution of Chemical Engineers has been publishing its transactions in annual volumes. To reduce to a practical minimum the delay between the presentation of papers and the issue of transactions, it has now been decided to publish them in parts, and the first part of Volume 29 has just been issued. Part II is to appear in January 1952 and Part III in April 1952. Thereafter the transactions will be published quarterly.

* * *

THE second edition (1950) of the Directory of Independent Consultants in Chemistry and Related Subjects, published by the RIC last July, contains particulars of independent consulting practices which are concerned with any of the various branches and applications of chemistry or certain related subjects, and in which Fellows or Associates of the RIC are Principals. The first edition was published in 1946, and was very well received. Particulars of the scope of the practices referred to are given, but practices headed by a non-member of the RIC are not included since the Institute cannot vouch for the conduct of these practices. Entries have only been accepted from individuals or businesses operating a consulting practice as a major activity, and there is a useful subject index at the back. Future editions are promised more frequently than before.

* * *

ON VIEW at the Engineering Marine & Welding Exhibition recently held at Olympia were three new products of Auto-klean Strainers Ltd. The Auto-klean T.K. strainer, on show for the first time, is a sectional twin-element model with 5.7 in. elements. The strainer element is made up of a number of metal plates with a washer between each. The gauge of the washer determines the degree of filtration. Two sizes of plates are used, the outside diameter of the smaller being equal to the inside diameter of the rim of the larger. The liquid being strained, passes through the narrow slots at the edges of the plates, and deposits solid matter on the plate edges. By turning a handle at the top of the strainer (manually or mechanically), the plates are revolved against fixed cleaner blades and the solid matter is removed from the element and deposited in the sump. Its advantages are finer meshes and lower pressure losses, with better flow characteristics. Also on view at the Exhibition were the company's Flushflo strainer capable of straining 10,000 gallons of lubricating oil per hour with an 18 in. by 9 in. diameter element of .003 in. mesh, and their Micro filter, produced with meshes of .0004 in., .001 in., and .002 in.

* * *

THE British Association for the Advancement of Science has just published the Presidential Address by H.R.H. The Duke of Edinburgh, K.G., F.R.S., together with the addresses by the presidents of sections at the 113th annual meeting of the society at Edinburgh recently. (For reports of the Presidential Address and Sir Cyril Hinshelwood's address to the Chemistry Section—*see* CHEMICAL AGE, 11 August, 1951.)

* * *

THE Durham Chemicals Group have recently produced a new brochure about themselves. It is a directory of Durham Chemicals, Ltd., and of its subsidiary and associated companies, and has been published, says the chairman, because so many developments and changes have taken place over the last three years, when the last edition was issued. The booklet is printed on linen face paper with several photographs of interest, and is very attractively brought out.

* * *

TIN metal is obtainable commercially in a high state of purity. Standard tin, as deliverable on the London Metal Exchange, is guaranteed to contain a minimum of 99.75 per cent tin, while special grades of a purity of 99.99 per cent, and higher are also available. Chemists, for special purposes, frequently have to determine the actual amounts of each different impurity in ingots containing 99.75 per cent of tin or over. Procedures for impurities of aluminium, antimony, arsenic bismuth cobalt, copper, iron, lead, nickel, sulphur, and zinc are given in a booklet 'Sampling and Analysis of Tin Ingots' by J. W. Price, F.R.I.C., now available from the Tin Research Institute, Greenford, Middlesex, or from its representatives in Belgium, France and Holland, and the U.S.A.

HOME

Another Large One

The refinery now under construction in Kent by the Anglo-Iranian Oil Company will process 4,000,000 tons per annum of Middle East crude oil. Its principal products will be motor spirit (965,000 tons a year), kerosine (110,000 tons), tractor vaporising oil (29,000 tons), gas oil (490,000 tons), fuel oils (1,862,000 tons) and lubricants (140,000 tons). Work began in mid-1950 and will be completed in three stages by 1953.

Wholly Irrelevant

Two readers, Mr. W. H. Huxtable, Intelligence Officer to The Coal Tar Research Association, and Mr. A. Williams, M.Sc., A.R.I.C. A.M.Inst.F. of Cheltenham, have drawn our attention to an error which appeared in the article 'Fluorine and Fluorine Substituted Hydrocarbons' which was published in our issue of 8 September. In the second paragraph of this article (on page 323) an erroneous reference was made to research work carried out by The Coal Tar Research Association. This work has been on the reactions of the hydrocarbon fluorene, not on the element fluorine.

Apart from the confusion in the wording of the passage referring to CTRA work, this information was wholly irrelevant in an article on fluorine.

'Fatherly Eye'

When at the annual conference of the West Riding of Yorkshire Urban District Councils' Association at Ilkley recently, Mr. J. E. Cowdell, Clerk of Mirfield, expressed his council's worry that the area would be affected by fumes from the extension to Huddersfield I.C.I. proposed in the town's development plan, Mr. Arthur Bates, Planning Officer to West Riding County Council, stated that the planning department were keeping a fatherly eye on those rural areas which would be adversely affected by urban factories and works. The plan, he said, was being examined in some detail.

Change of Address

The London area and export sales offices and warehouse of W. & J. George & Becker, Ltd., have now moved to Nivoc House, Ealing Road, Alperton, Wembley, Middlesex. Telephone: Perivale 3344.

Overseas Associates

Dr. M. A. Phillips and associates, the well-known firm of chemical consultants, have announced that they are now associated with the following overseas establishments: Foster D. Snell Inc., 29 West 15th Street, New York 11; Pierre Cor, 145 Rue de la Pompe, Paris, 16e; H. R. Hilfiker & Co., Weinbergstrasse, 11, Zurich, and Dr. A. Villa, Via Pergolesi 24, Milan.

A Century of Rubber Development

A two-day exhibition in connection with the Manchester and District Section meeting of the RIC and the Dalton Lecture was held in the Town Hall, Manchester, on 27 and 28 September. The Dunlop exhibit '100 Years of Rubber', was designed to show some of the outstanding developments in the rubber industry, its dependence on the chemical manufacturer for raw materials and the service it renders in return by supplying finished rubber products needed in the chemical and other industries. Basic discoveries of early rubber pioneers such as Hancock and Goodyear were illustrated. Emphasis was placed on the contributions of applied chemistry to the progress of rubber technology and on the important development of the so-called synthetic rubber and allied elastomers.

Coal Dust into Fuel

Some 20,000,000 additional tons of coal a year could be available if research being carried out at the National Coal Board's Research Establishment at Stoke Orchard, Gloucestershire, proves satisfactory. Dr. J. Bronowski, director, said that present coal-cutting methods resulted in some 10 per cent being reduced to dust or very fine dirty coal. He foresaw the day when coal would be properly regarded as a chemical and not 'just something you throw on the fire'.

New Welsh Coking Plant

A new coke oven plant, built at a cost of about £3,000,000, was officially opened by the Minister of Fuel and Power (Mr. Noel Baker), on 20 September, at Nantgarw, Glamorgan. The plant will carbonise 1,300 tons of coal a day.

The Chemist's Bookshelf

FLUORINE AND ITS COMPOUNDS. By R. N. Haszeldine and A. G. Sharpe. London: Methuen & Co., Ltd. 1951. Pp. 153. 8s. 6d.

This book is one of Methuen's Monographs on Chemical Subjects which attempt to give brief but authoritative accounts of the present state of knowledge in various departments of chemistry, and to convey information, which otherwise can be obtained only at the cost of considerable time and trouble by a person who is not engaged in that particular branch.

As to the subject of this book, Moissan's preparations of fluorine in 1886 was the culmination of a century of research on the isolation of this halogen. His work on fluorine and its compounds was summarised in the monograph 'Le Fluor et ses Composés' in 1900. Ruff, another pioneer in this field, published his book 'Die Chemie des Fluors' in 1920. No balanced account of the chemistry of fluorine and its compounds has appeared since that date and this little book aims to fill the gap, making reference to most of the important work up to now.

Its contents are divided into four chapters. The first, on fluorine, deals with history, occurrence, isolation, chemical and physical properties of the element and with its analytical detection and determination, whilst the second discusses hydrogen fluoride which is mainly used for glass etching, for removing silica from canes and sand from castings, and as an antiseptic, etc. The other chapters deal with inorganic and organic compounds of fluorine, their methods of preparation, synthesis and uses.

In the study of fluorine compounds, a new field of chemistry, in which vast numbers of compounds are theoretically possible, is being opened up. Research in this sphere is very active, and the industrial application of the results of these investigations should lead to the widespread use of fluorine compounds in industry and everyday life. It is clearly impossible, however, for so small a book to be fully comprehensive on so large a subject, but the more than 150 references to literature relative to the matter which have been included, will serve as a valuable supplement to the text.—F.N.

ENCYCLOPAEDIA OF CHEMICAL REACTIONS. Vol. IV. Edited by C. A. Jacobson. Reinhold Publishing Corporation, New York. Chapman & Hall, London. 1951. Pp. 788. 112s.

In Volume IV of the Encyclopaedia information has been collected upon the chemical reactions of nine metals in the alphabetical section I to N. These are iron, lanthanum, lead, lithium magnesium, manganese, mercury, molybdenum and neodymium. In the introduction to the present volume it is stated that in the compilation of the material a number of duplicate or near duplicate reactions were encountered. This difficulty has been avoided by the removal of such reactions from the list and their substitution by other reactions. Where no substitution that would fit into the alphabetical system of the Encyclopaedia could be found, certain numbers of the duplicate reactions have been omitted. The index has been modified in conformity with these deletions and substitutions made.

While realising that space is always a consideration, even in the compilation of an encyclopaedia, this policy cannot be viewed without concern. The object and function of a work such as this is to facilitate the securing of information. This purpose is only served by making the indexing system simple and the coverage complete, duplication should be a secondary consideration. Once there is a suspicion that the coverage is incomplete or the information becomes difficult to track down, then the conscientious literature searcher will prefer to approach the general literature. To investigate the point, however, six reactions were picked at random and in each case it was found easy to identify and find the reaction from both the reagent and 'substance obtained' indices using the name and formula sections separately. —J.R.M.

Next Week's Events

MONDAY 1 OCTOBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1. 6.30 p.m. Joint meeting with the London and South-Eastern Counties Section of the Royal Institute of Chemistry. J. C. Hanbury: 'Early Developments in the Fine Chemical Industry—an Historical Survey'.

TUESDAY 2 OCTOBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1. 5.30 p.m. Crop Protection Panel of the Agricultural Group. N. A. Richardson, head of the Wood Preservation Section, Forest Products Research Laboratory: 'Timber Preservation'.

Institution of Works Managers

Leicester: Bell Hotel, 7.0 p.m. Leicester branch annual dinner. R. Siddall: 'Restrictive Practices'.

WEDNESDAY 3 OCTOBER

Society of Public Analysts

London: Burlington House, Piccadilly, W.1. 7.0 p.m. Christina C. Miller and Robert A. Chalmers: 'A Critical Investigation of the Use of the Silver Reductor in the Micro-Volumetric Determination of Iron, especially in Silicate Rocks'; J. King: 'A Technique to Improve the Efficiency of Desiccators'; G. W. C. Milner and R. N. Whittem: 'Controlled Potential Electrolysis in the Analysis of Copper Base Alloys'.

Royal Photographic Society

London: Film House, Wardour Street, W.1. 7.15 p.m. Scientific and Technical Group. Symposium on 'Chemical Shortages and the Efficient Use of Processing Solutions' in conjunction with the British Kinematograph Society. D. H. O. John: 'Survey of Chemical Resources'; Dr. S. P. Gloyns: 'Continuous Film Processing'; S. E. Flannery: 'Regeneration of Silver Bleach Baths'; C. J. Sharpe: 'Silver Recovery and Hypo-Regeneration'; and Dr. J. B. Kenball: 'A New Commercial Developing Agent'.

THURSDAY 4 OCTOBER

Royal Institute of Chemistry

Dagenham: South East Essex Technical College, Longbridge Road, 6.30 p.m. C. G. A. Hill: 'Luminescence in Inorganic Chemistry'.

Textile Institute

Manchester: 16 St. Mary's Parsonage, 6.30 p.m. G. K. Lake, director of research, Pepperell Manufacturing Co., U.S.A.: 'Developments of the New Synthetic Fibres in the U.S.A.'

FRIDAY, 5 OCTOBER

Society of Chemical Industry

Glasgow: Royal Technical College, 7.15 p.m. G. R. Campbell and S. A. Chodkiewicz: 'A Review of the Waste Salt Problem at Ardeer'; W. Gibb: 'Pine Oil as a Flotation Reagent'; M. Gordon and J. S. Taylor: 'Co-Polymer Volumes'.

Incorporated Plant Engineers

Dunblane, Perthshire: Scottish conference (until 7 October). Speakers include: L. G. Northcroft: 'Coal and Europe'; D. Lacy-Hulbert, president of the institution, and J. F. Field, controller, South East Scotland Division, British Electricity Authority.

Institution of Works Managers

London: St. Ermin's Hotel, S.W.1, 6.45 p.m. Annual general meeting and dinner.

ASLIB

Leamington Spa: Association of Special Libraries and Information Bureaux, 26th annual conference (until 8 October).

Physical Methods Group

THE 33rd ordinary meeting of the Physical Methods Group of the Society of Public Analysts and Other Anaytical Chemists will be held in Billingham on Friday, 19 October. This is a joint meeting with the Tees-side Section of the Royal Institute of Chemistry: the subject of the meeting will be 'Physical Methods in the Pigment Industry'.

The arrangements are as follows:—

3.00 p.m. Visit to the Research Laboratory of British Titan Products Co., Ltd., at Billingham.

7.00 p.m. Meeting in William Newton School, Norton.

The papers to be read at the meeting will be the following:—

7.00 p.m. Opening remarks by chairman.

7.05 p.m. 'Physical Methods in the Titanium Pigment Industry'. By F. R. Williams Ph.D., F.R.I.C.

7.25 p.m. 'Rapid Methods of Quantitative Analysis of Rutile/Anatase Mixtures'. By W. Hughes, Ph.D., and H. Smith, M.Sc.

7.45 p.m. 'Surface Area Measurements by the High Vacuum Nitrogen Adsorption Method'. B. C. T. Morley Smith, B.Sc., F.R.I.C.

8.05 p.m. Open discussion.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CLODOL INDUSTRIES. LTD., Newcastle-on-Tyne, chemical manufacturers. (M., 29/9/51). 4 August, £11,000 charge, to Grainger Building Society; charged on 11, 13 and 15 Blenheim Street, and 25/27 Temple Street, Newcastle-on-Tyne.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 29/9/51). 4 August, £1,000 debentures, part of a series already registered. *£5,000. 17 October, 1950.

PEST CONTROL (UNITED KINGDOM), LTD., Bourn (Cambs.). (M., 29/9/51). 8 August, £1,000 charge, to Coventry Permanent Economic Building Society; charged on 205 Yarborough Road, Grimsby. *£418,448. 31 December, 1949.

SHEPPY GLUE & CHEMICAL WORKS, LTD., Horley. (M., 29/9/51). 7 August, £2,800 charge to T. O. Wood, Torquay, and another; charged on Cedar Lodge, Bonehurst Road, Horley. *£1,000. 3 April, 1951.

New Registrations

Biophage Laboratories, Ltd.

Private company. (499,433). Capital £1,000. Importers, manufacturers and exporters of drugs and medical, veterinary, biological and pharmaceutical preparations, etc. Directors: A. F. Harris and H. M. Harris. Reg. office: 287 Portland Road, South Norwood, S.E.25.

C. Eamon & Co., Ltd.

Private company. (499,502). Capital £1,000. Manufacturers, importers and exporters of chemicals, pharmaceutical products, etc. Directors: C. M. Shah and S. W. Vora. Reg. office: 47 Great Russell Street, W.C.1.

Halewood Chemicals (Overseas), Ltd.

Private company. (499,508). Capital £5,000. Manufacturers, importers and exporters of pharmaceuticals, drugs, fine and heavy chemicals, etc. Directors: G. J. Pritchard and M. Pritchard. Reg. office: 118/9 Cheapside, E.C.2.

Hart Fertilizer, Ltd.

Private company. (499,470). Capital £2,000. Manufacturers of fertilisers, manures, insecticides, germicides, etc. Directors: H. F. Hart, Mrs. J. E. Hart and Wm. G. Codd. Reg. office: 46 Preston Street, Brighton.

Pest Control (Chemicals), Ltd.

Private company. (499,517). Capital £100. Chemists, druggists, drysalters. First directors to be appointed by subscribers. Reg. office: Harston, Cambs.

Company News

Albright & Wilson, Ltd.

At a meeting of the board of Albright & Wilson, Ltd., held on 19 September, an interim dividend of 5 per cent (less tax) on ordinary stock, was declared for the year ending 31 December, 1951. The dividend is payable on 29 September*to stockholders on the register as at 19 September, 1951.

The Distillers Co., Ltd.

The directors of The Distillers Co., Ltd., announced that they have declared a dividend on the preference stock for the six months ended 30 September, 1951, at the rate of three per cent less income tax, payable on 15 November, 1951, to stockholders on the register at 14 September, 1951.

Hilger & Watts, Ltd.

Issue of a further £100,000 debenture stock is announced by Hilger & Watts, Ltd., scientific instrument makers. Consent has been obtained from the Capital Issues Committee and the necessary resolutions passed. The additional finance is required to complete the erection of pilot plant at the company's factory at Debden, and is made necessary by the increased cost of materials. The new stock has been offered to existing debenture holders at par in the proportion of £50 for every £100 held. Terms of the original trust deed have been modified so that stock will now carry interest at 5 per cent per annum as from 1 October, 1951, and the earliest optional redemption date has been extended to 1960, with the final redemption date 1970. A cumulative sinking fund of £3,000 a year will start operating in the year ending 31 March, 1955.

British Chemical Prices

LONDON.—Conditions are unchanged on the week with the demand for heavy chemicals continuing active. There is no scarcity of new business for export account and there is a good outlet for available supplies of most items. Prices generally remain steady at recent levels, the only alterations recorded being the increase in the quotations for tartaric acid, cream of tartar, barium sulphate and barium carbonate. The lead oxides are in steady request and there is a persistent inquiry for titanium oxide. Firm and brisk conditions prevail in the coal tar products market with pyridene prices strong on a tight supply position.

MANCHESTER.—Chemical traders on the Manchester market during the past week have reported a steady flow of delivery specifications covering the full range of soda compounds and many other lines from home users, while new business on both the home and export markets has been on a satisfactory scale. Price changes compared with a week ago have not been numerous, but the tendency is still towards higher levels. A moderate weight of business has been reported in the general run of fertilisers. The tar products are meeting with a good demand in almost all sections.

GLASGOW.—There have been no fresh developments during the past week although trade has certainly been brisker than during the previous seven days and generally speaking the demand is steady, with some sections of the industry extremely busy. The export market has been fairly active.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 1 ton, £110 ; 80% pure, 1 ton, £116 ; commercial glacial 1 ton, £129 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £166 per ton.

Acetone.—Small lots : 5 gal. drums, £105 per ton ; 10 gal. drums, £100 per ton. In 40/50 gal. drums less than 1 ton, £85 per ton ; 1 to 9 tons, £109 per ton ; 10 to 50 tons, £108 per ton ; 50 tons and over, £107 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots. d/d, 4s. 7½d. per proof gallon ; 5000 gal. lots, d/d, 4s. 8½d. per proof gal.

Alcohol, Diacetone.—Small lots : 5 gal. drums, £133 per ton ; 10 gal. drums, £128 per ton. In 40/45 gal. drums : less than 1 ton, £113 per ton ; 1 to 9 tons, £112 per ton ; 10 to 50 tons, £111 per ton ; 50 to 100 tons, £110 per ton ; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER : Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER : £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £47 per ton.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER : £5 15s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £88 and £86 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots as to grade, etc., 2s. 7d. to 3s. 8½d. per lb. Crimson, 4s. 1d., to 5s. 6d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d ; 2-ton lots, £33 5s. per ton, bag packing.

Barium Chloride.—£40 10s. 2 ton lots d/d bags.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £41 per ton d/d ; 2-ton lots, £41 5s. per ton d/d.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags; commercial, granular, £39 10s.; crystal, £42; powder, £43; extra fine powder, £44; B.P., granular, £48 10s.; crystal, £51; powder, £52; extra fine powder £53.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £68; crystal, £76; powder, £73 10s.; extra fine powder, £75 10s.; B.P., granular, £81; crystal, £88; powder, £85 10s.; extra fine powder, £87 10s.

Butyl Acetate BSS.—£263 per ton, in 10-ton lots.

Butyl Alcohol BSS.—£250 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4-ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Per lb., d/d buyers' premises, for 5 cwt. or over, anhydrous, 1s. 9d. plus 10%, other, 1s. 9d.; 1 to 5 cwt., anhydrous 1s. 9½d. plus 10%, other 1s. 9½d. Higher prices for smaller quantities. All subject to a trade discount of 5%.

Cobalt Oxide.—Black, delivered, 11s. 2d. per lb.

Copper Carbonate.—MANCHESTER: 2s. 6d. per lb.

Copper Chloride.—(63%), d/d, 2s. 9d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63%), d/d, 2s. 8d. per lb.

Copper Sulphate.—£97 2s. 6d. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £13 12s. d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £174 per ton.

Formaldehyde.—£33 per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1,260 s.g. £14 9s. 0d. per cwt.
Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 3d. to 2s. 6d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 9s. 6d. to 10s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £116 per ton. 35% wt. £146 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 21s. 4d. per lb. in cwt. lots.

Iodoform.—24s. 9d. per lb. in cwt. lots.

Iron Sulphate.—F.O.R. works, £3 15s. to £4 5s. per ton. Bags free.

Lactic Acid.—Pale tech., 44 per cent by weight £130 per ton; dark tech., 44 per cent by by weight £110 per ton ex works; Usual container terms.

Lead Acetate.—White: £194 10s. per ton.

Lead Carbonate.—Nominal.

Lead Nitrate.—£161 10s. per ton.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £198; orange lead, £210. Ground in oil: red, £219; orange, £231.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £204 per ton. Ground in oil: English, under 2 tons, £220.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82%, ton lots, d/d, £22 to £25 per ton.

Litharge.—£198 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £87 15s.; cwt. lots £97 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £221; cwt. lots £227 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 10s. 8d.; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 2d. per gal. ; pyridinised 64° O.P. 100 gal., 4s. 4d. per gal.

Nickel Sulphate.—Deld. buyers U.K. £140 10s. per ton.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—About £146 per ton, packed in 5-cwt. lots, packed in free 5-cwt. casks.

Paraffin Wax.—Minimum 1-ton lots £76 5s. ; smaller quantities £77.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £67 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 2½d. per lb.

Potash, Caustic.—Solid, £88 10s. per ton for 1-ton lots ; flake, £105 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 10¾d. per lb. ; ground, 11¾d. per lb., for not less than 6 cwt. ; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £88 10s. per ton for 1-ton lots, ex store ; hydrated, £81 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96%, 6-ton lots, £16 10s. per ton.

Potassium Iodide.—B.P., 18s. 5d. per lb. in 28 lb. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 6½d. per lb. ; technical, £8 3s. per cwt. ; for 5 cwt. lots.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s. per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. to 2s. 10d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £21 12s. 6d. per ton d/d. (4 ton lots).

Sodium Acetate.—£85 to £91 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 9d. per lb. ; anhydrous, 9¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£87 to £95 per ton.

Sodium Cyanide.—100% basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £28 a ton ; commercial, 1-ton lots, £26 per ton carriage paid.

Sodium Iodide.—B.P., 19s. 8d. per lb., in 28 lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £114 ton.

Sodium Metasilicate.—£21 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £29 15s. per ton.

Sodium Nitrite.—£29 12s. 6d. per ton.

Sodium Percarbonate.—12½% available oxygen, £8 4s. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £34 10s., anhydrous, £73 ; tri-sodium, crystalline, £36 10s., anhydrous, £70.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £27 per ton, d/d, in drums ; broken, £27 15s. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £57 12s. 6d. per ton ; pea crystals, £35 7s. 6d. per ton d/d station in kegs ; commercial, £22 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £20 4s. 6d. to £22 9s. 6d. according to fineness.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £16 10s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d (56-lb./112 lb. bags), £115 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d ; white seal, £207 10s. ; green seal, £206 10s. ; red seal, £205.

Zinc Sulphate.—Nominal.

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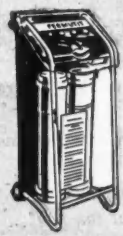

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Rubber Chemicals

Antimony Sulphide.—Golden, 2s. 6½d. to 3s. 8d. per lb. Crimson, 3s. 6½d. to 4s. 9½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Off colour, ex store. Imported £13 10s per ton. Extra white bleached ex store, £16.

Cadmium Sulphide.—About 20s. per lb.

Carbon Bisulphide.—£65 5s. per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£69 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 1s. 9½d. to 2s. 3d. per lb. ; dark, 1s. 8½d. to 2s. 1½d. per lb.

Lithopone.—30%, £62 10s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £15 4s. 6d.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £25 14s. 6d.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots d/d nearest station, £29 15s. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works : 90's, 3s. 8½d. ; pure, 3s. 11½d. ; nitration grade, 4s. 2½d.

Carbolic Acid.—Crystals, 1s. 6d. to 1s. 8d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 6½d. to 1s. 8d. per lb., d/d crude, 5s. 9d., naked, at works.

Creosote.—Home trade, 8d. to 10½d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 9d. to 11¾d. per gal.

Cresylic Acid.—Pale 98%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 10s. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 2½d. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 8d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots.

Naphthalene.—Crude, ton lots, in sellers' bags, £18 2s. 3d. to £29 5s. 9d. per ton according to m.p. ; not-pressed, £50 to £60 per ton, in bulk ex works ; purified crystals, £60 to £70 per ton. F.O.B.

Pitch.—Medium, soft, home trade, 130s. per ton f.o.r. suppliers' works ; export trade, 200s. per ton f.o.b. suppliers' port. MANCHESTER : £7 10s. f.o.r.

Pyridine.—90/160°, 27s. 6d. per gal. MANCHESTER : 32s. 6d. to 36s. per gal.

Toluol.—Pure, 4s. 7½d. per gal. MANCHESTER : Pure, 4s. 7¾d. per gal. naked.

Xylol.—For 1000-gal. lots, 5s. 1½d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton ; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal. ; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediate and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—3s. 9d. per lb. d/d.

***o*-Cresol** 30/31° C.—1s. per lb. d/d.

***p*-Cresol** 34/35° C.—3s. 9d. per lb. d/d.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb. ; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 11d. per lb.

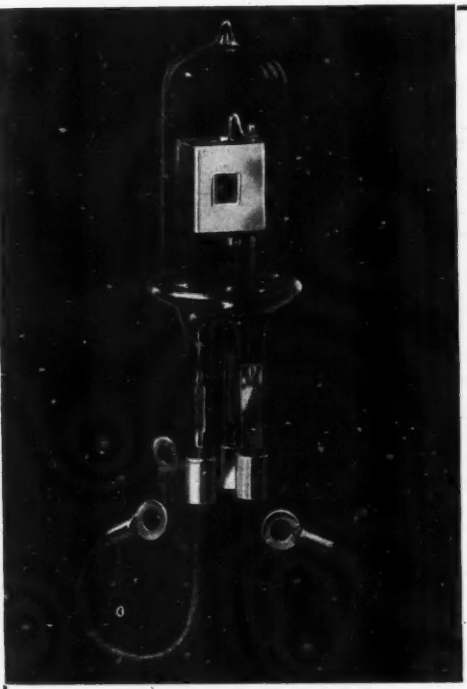
Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb. ; P.G. 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.



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Chemical & Allied Stocks & Shares

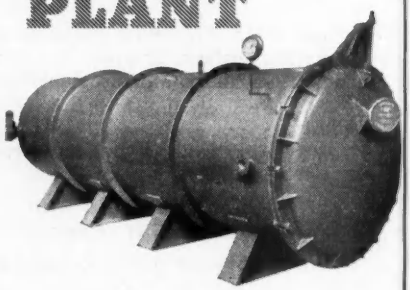
HOPES that the General Election may bring a change of Government and an end of dividend limitation, resulted in a big rally in stock markets under the lead of industrial shares which in many cases rose to levels ruling before Mr. Gaitskell's dividend control speech at the end of July. Shares of companies which have recently reduced their dividends to comply with limitations were marked up sharply in the hope that these 'cuts' would be made good to shareholders if dividend limitation were ended. Many companies in recent weeks have started special reserves for this purpose, notably Triplex Glass and Qualcast, while others have decided to leave their decisions on final dividends until after the General Election result. Earlier gains in industrial shares have not been fully held because a more cautious attitude has developed owing to the latest indications of growing competition in export markets and the fear that figures for the September quarter, due shorty, will show a sharp contraction in the sterling area's gold and dollar reserves.

Chemical Shares Rally

As was to be expected, chemical and allied shares have participated strongly in the market rally because in general it is believed that dividends will be maintained at last year's rates if the Gaitskell limitation scheme does not become law. I.C.I. were 52s. 3d. compared with 50s. 7½d. a month ago, Fisons have risen from 31s. 6d. to 32s. 6d., and Monsanto from 25s. 9d. to 27s. British Glues & Chemicals, helped by the share bonus proposals rose from 28s. 3d. to 32s. 6d., while Brotherton were 23s. 9d., F. W. Berk were 2s. 6d. shares 7s. and Albright & Wilson 5s. shares 21s. 3d., William Blythe 3s. shares were 11s. 6d., and Borax Consolidated have risen to 36s. 3d. The 4s. units of the Distillers Co. were 23s. 6d. helped by the chairman's review of the group's diversified activities. Turner & Newall rose to 100s. and in other directions, British Xylonite have moved up to 95s. There was a big rally to 82s. 6d. in Glaxo Laboratories because of market expectation of a higher dividend if the Gaitskell 'freeze' does not become law. British Aluminium were up to 43s. 7½d. and British Oxygen to 97s. 9d. Triplex Glass became prominent with a rise to 30s. 3d., and United Glass Bottle were better at 83s. 9d. In other directions, Powell Duffryn strengthened to 36s. on the full results and chairman's review of the company's progress in acquiring new interests to make good the nationalisation of its collieries.

Boots Drug rallied to 26s. 9d., Sangers were 23s. 3d., and United Molasses 38s. 6d. Levers moved up to 56s., Dunlop Rubber to 67s. 6d., and Associated Cement were 110s. 6d. while Lewis Berger 4s. units moved up to 20s. because the market expects an increase in dividend if Gaitskell limitation does not become law. Oils have moved somewhat sharply. Anglo-Iranian were slightly over £5¼. Shell rose to 95s. 7½d. on the view that the dividend might be raised to 15 per cent, tax free, if the Gaitskell 'freeze' is dropped. Trinidad Leaseholds kept active on the company's Canadian oil plans and Ultramar have been up to close on 34s. 6d.

CHEMICAL PLANT



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A CHEMICAL ENGINEER is required by well known chemical manufacturers in South Lancashire. The vacancy is in the Design and Development Department, and offers considerable scope for advancement. The work is varied and interesting, and calls for a thorough knowledge of the fundamentals of chemical engineering. Candidates should be well qualified, with preferably A.M.I.Chem.E. Applicants should write to Box No. C.A. 3042, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

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APPLICATIONS are invited for the following post: **PUBLIC ANALYST** (27106/53/51), **NORTHERN RHODESIA.** Appointment on probation for pensionable and permanent employment. Salary in the scale £585-£1,320, plus a cost-of-living allowance of 16 per cent of salary. Government quarters with heavy furniture provided when available at a rental of not more than 10 per cent of salary. Free passages for officer and wife and for children up to the cost of one adult fare. Free medical attendance for officer and family within Northern Rhodesia. Income Tax, water, light and sanitary fees payable at local rates. Tour of service, 2½ to 3 years. Five days' vacation leave on full salary for each completed month of resident service. Candidates should possess the Associateship of the Royal Institute of Chemistry or its equivalent and should preferably have passed the examinations in Branch "E" or have had equivalent experience. They will be expected to perform the normal duties of a Public Analyst, including toxicology. Age limits, 25-35.

Intending candidates should apply in writing to the **Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1,** giving brief details of their age, qualifications and experience. They should mention this paper and quote the reference number (27106/53/51).

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APPLICATIONS are invited for the following post: **CHEMIST** (27106/35/51) **TANGANYIKA.** Appointment on 2 years' probation for permanent and pensionable employment. Salary, according to qualifications and experience, in the scale £620-£1,320, plus an emergency allowance of 20 per cent of salary subject to a maximum of £200 per annum. Quarters are provided, if available, subject to a rental deduction of 10 per cent of salary. Free first-class passages are provided for officer and wife and for children up to the cost of one adult fare. Officers are required to travel by air on leave. Taxes, including Income Tax, at low local rates. Tour of service, 2-3 years. Six days' leave on full salary for each completed month of resident service. Candidates should be between 20 and 30 years of age and should possess an Honours Degree in Chemistry or Associateship of the Royal Institute of Chemistry. Duties include general analytical work of a development research nature, particularly in connection with agriculture; general all-round interest in industrial chemistry, food and drugs, toxicology; supervision of African assistant chemists and chemical assistants.

Intending candidates should apply in writing to the **Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, S.W.1,** giving brief details of their age, qualifications and experience. They should mention this paper and quote the reference number (27106/35/51).

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PURCHASING EXECUTIVE

AN engineer with administrative ability and extensive experience in purchasing heavy engineering equipment and machinery is required to head department of large petroleum refinery construction and engineering firm in City of London. Salary will be fully commensurate with the requirements of this important position in expanding organisation, and will be dependent on experience and qualifications, of which fullest details may be written in confidence to Box C.A. 3046, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WELL KNOWN ANGLO-AMERICAN ENGINEERING AND CONTRACTING FIRM in the City of London requires for oil refinery work:—

TWO SENIOR REINFORCED CONCRETE DESIGNERS. — Chartered Structural and/or Chartered Civil Engineer, minimum of 8-10 years' experience in design of continuous R.C. structures, heavy foundation design, including piling, raft foundation and sheet piling. Must be able to assume responsibility and direct 2-3 draughtsmen.

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FOUR PIPING LAYOUT DESIGNERS. H.N.C or equivalent, with minimum of 10 years' piping experience. Must be capable of designing complete pipework installation for refinery and chemical plants to A.S.A. Standards. Applicants must be able to direct 4-5 draughtsmen.

ONE MECHANICAL EQUIPMENT ENGINEER, Grad.I.Mech.E. Must be familiar with British equipment manufacturers, thorough knowledge of design and construction of compressors, blowers, turbines, centrifugal and reciprocating pumps. Minimum 10 years' experience, preferably within oil refinery field.

ONE HEAT EXCHANGER DESIGNER/DRAUGHTSMAN. H.N.C. or equivalent. 8-10 years' experience in draughting office and shop. Must be familiar with A.P.I. Code and T.E.M.A. Standards. Capable of turning out design drawings from data sheets and specifications.

Excellent salaries and opportunities are offered to men of ability and ambition. Give full details of age, experience, etc., to Box C.A.3047, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

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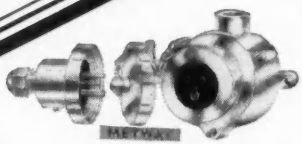

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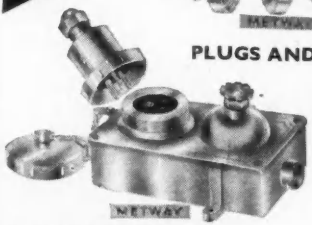

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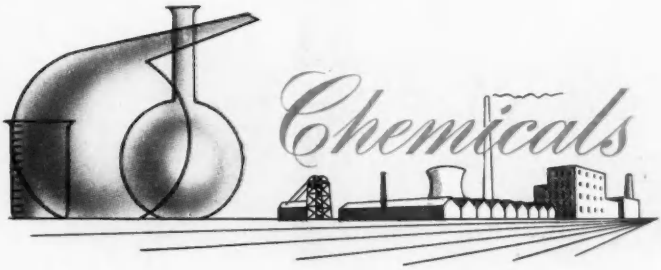

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